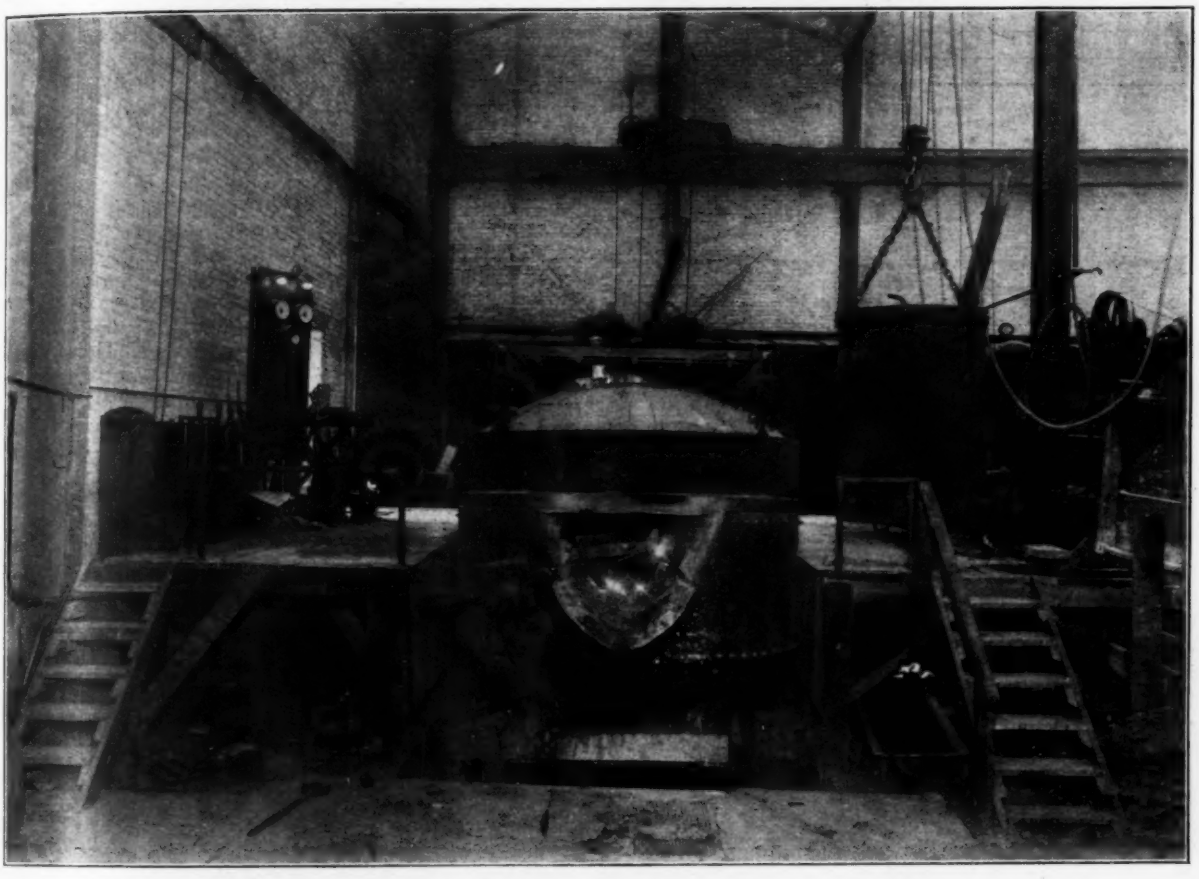
Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

VOL. 71—No. 23. CHICAGO, SATURDAY, DECEMBER 8, 1917. PAGE 963



A Five-Ton Three-Phase Snyder Furnace in Operation. To Charge, the Roof Is Tilted Back and the Bottom-Dump Charging Bucket Filled With Scrap, as Shown at the Right, Is Lowered Into Furnace.

Refining of Steel by Electric Furnace Process

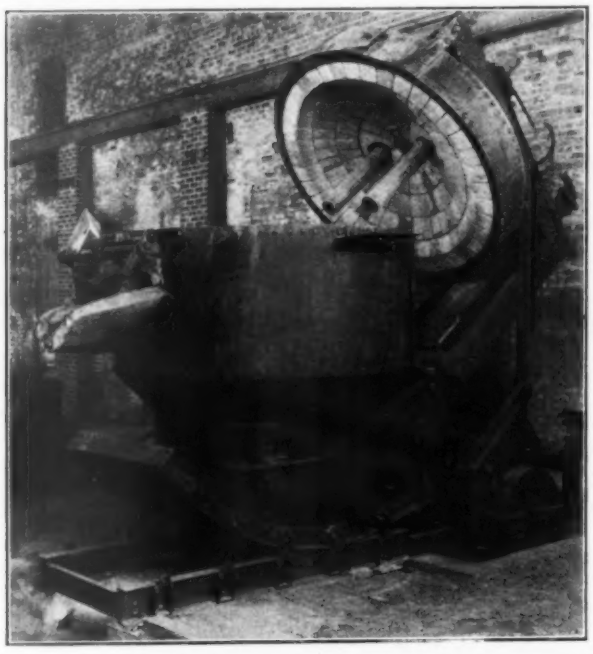
Some Details and Advanges of Electric Steel Smelting and Refining —Economy and Reliability of Process—Superior Quality of Product

By C. A. TUPPER

FROM the central-station point of view, the electric furnace is an attractive load, as it can be kept in continuous operation during off-peak hours. In the case of arc furnaces of average size the power-factor is 70 to 90 per cent. Single, two or three-phase current of any frequency from 20 to 60 has been used without difficulty, usually in the case of a two-phase system being transformed from three-phase current, which can be readily done. The load-factor, as a rule, will be most favorable.

The usual practice when refining hot metal, for example, in a 15-ton furnace, is to use 2000 kilowatts for 20 minutes after charging, while the steel is being heated. The current is then reduced to about 1500 kilowatts for 45 to 75 minutes until the steel is ready for teeming. There is then an interval of ten or fif-

teen minutes, during which the furnace is teemed, fettled and charged, which allows the transformers or generators time to cool before the period of heavy load again commences. Current fluctuations occur for a few minutes, while there is an evolution of gas from the steel which makes the bath boil up and touch



A Three-Ton Three-Phase Snyder Furnace With Newly Lined Roof Tilted Back for Charging. Note Two Arc Electrodes.

the electrodes. This, however, is not sufficient to be objectionable, provided that the electrical equipment is properly designed for the purpose. The extent of these variations is not so great as in the case of many rolling mills. For example, in the works at South Chicago, Ill., where 2000-kilowatt furnaces have been working since May, 1909, the fluctuations in voltage have been only about 3 per cent.

From the standpoint of the operator it is but necessary to survey the development of the manufacture of electric steel, as it stands today, to be convinced of the fact that the process must be accepted as among metallurgical standards. The electric furnace is now extensively used in Europe and the United States as an adjunct to the Bessemer converter and open-hearth furnace for the production of steel for rails and many other classes of railway material, and in connection with the basic open-hearth process for the manufacture of steel for castings and tool steel of all kinds. But probably the more important application is in melting steel scrap for steel foundries. It is now possible to make steel for foundry purposes much cheaper in an electric furnace than by any fuel method.

But a short time ago the electric furnace was thought to be available only where steel of exceptionally high grade and purity was to be made. But these ideas have been changed by results obtained from improved sets of apparatus so that the lower grades of steel are now recognized as being well within the scope of the electric furnace. Similarly, the capacity of the primary furnace can be increased and at the same time the quality of the metal improved. Another source of economy is the possibility of using lower-grade pig and scrap with a finished product equally as good as with more costly material.

In Germany and in Austria the crucible process had even before the war been nearly, if not wholly, supplanted by the electric furnace in quite a number of large plants and with reduced costs for light and difficult castings. Similar progress has been made in this country, especially in recent years, when the cost of crucibles became almost prohibitive.

The requirements of the refining process are peculiarly well fulfilled by the electric furnace. The high temperatures which are obtainable and the exactness with which the heat can be regulated are desirable factors in securing predetermined results and are the ideal features of operation. The "stirring effect," due to electromagnetic action, gives to the refined metal a uniformity which it is impossible to secure in other furnaces, and this action, coupled with the high temperatures, also materially increases the rate of refining.

Electric Refining Auxiliary to Bessemer and Open-Hearth Processes.

The usual procedure for the use of the electric furnace in connection with the Bessemer and open-hearth processes, according to standard practice abroad as well as in this country, is as follows:

With the Bessemer converter the steel is charged, holding back all slag in the ladle, after putting on the bottom of the furnace lime and mill scale or iron ore. This produces an oxidizing or dephosphorizing slag, which may be carefully skimmed or poured off. Carbon is then thrown on the bath to carburize to any required degree, and then a second highly basic and desulphurizing slag is added. The arc acting on the calcareous slag produces calcium carbide, which may combine with sulphur to form calcium sulphide. As neither gases nor air enter the furnace and the conditions are almost completely reducing, no sulphates are formed, a dead melt is easily obtained and, when the slag is molten and the requisite heat is obtained, the steel is teemed. In the open-hearth or any oxidizing furnace these reactions cannot take place so completely and efficiently.

With steel from the basic open-hearth furnace, the procedure is similar, but when the quantity of the phosphorus to be removed is small it is only necessary to use one refining slag for the elimination of the sulphur and any small amount of the phosphorus remaining. The usual practice is to put the carbon necessary for carburizing on the bottom of the furnace and then add the steel and the basic slag materials. As soon as the teeming heat is obtained the necessary ferro-alloys are added and the steel will be completely refined.

Failure to secure satisfactory results from an electric furnace may, in the majority of cases, be attributed to improper handling. There are so many details, due to different qualities of materials, that it would be impossible to point out definitely how such errors may be avoided, but that this statement must be true is evidenced by the fact that where one concern fails to secure satisfactory results several others succeed, and the progress of electric smelting and refining of iron and steel is going steadily forward and for the last year or two quite rapidly.

The electric furnace is particularly well adapted to the refining of steel, as the process of heating does not in any way add impurities, such as sulphur, to the metal. It is easy to maintain a non-oxidizing atmosphere in the hearth and higher temperature may be obtained than in other types of furnaces. These higher temperatures are in many cases decidedly advantageous, particularly where it may be desirable to have

a very fluid metal as is required for especially thin and delicate castings.

Details of Electric Refining Process.

The process of refining, which begins after the charge is in a molten state, may be divided into two periods, namely, oxidizing and deoxidizing. Furnaces for reducing phosphorus are lined with a basic material, such as dolomite, and oxidation is effected by adding iron ore or rolling-mill scale together with lime, which forms a basic slag. Sulphur (S), silicon (Si), carbon (C), and manganese (Mn) may, with such a slag and a proper temperature, be more or less oxidized. If the metal is high in carbon it may require several slags to reduce it to the desired carbon content. Phosphorus (P) is taken up by the slag, forming phosphoric oxide (P_2O_5), and also a small amount of the sulphur, although the greater percentage of the latter is removed during the deoxidizing period.

To illustrate the chemical reactions which take place, the following figures showing the analysis of partially refined open-hearth material and analyses of samples taken after the different quantities of slag material were added are given:

Analyses of Bath During Refining.

Furnace, three-ton Girod.
Material, open-hearth steel, partially refined.

Sample.	C.	Si.	Mn.	P.	S.
No. 1. Charged material	0.15	Tr.	0.54	0.034	0.054
No. 2. After adding 22 lbs. of iron ore..	0.14	Tr.	0.40	0.021	0.048
No. 3. After adding 33 lbs. of iron ore..	0.14	Tr.	0.34	0.016	0.044
No. 4. After adding 55 lbs. of iron ore..	0.10	Tr.	0.29	0.008	0.046

The oxidizing slag is now poured from the furnace to permit of adding the deoxidizing materials. If the first slag were to remain the phosphorus, which it has absorbed, would be again driven back into the bath.

For the deoxidizing slag carbon is now added in the form of petroleum coke, coal or other forms of pure carbon, with lime (CaO), sand, fluorspar (CaF_2) and ferro-silicon (FeSi). The progress of deoxidation may be followed by noting the color of the molten slag, which changes from black to white as the ferrous oxide returns to the bath. The furnaceman is thus enabled to determine when the reaction is complete. Some period of time after the slag has become white is necessary for the absorption of the sulphur in the bath by the slag.

It is stated by some authorities that the removal of sulphur in the electric furnace is due to the formation of calcium sulphide, but others contend that if calcium sulphide is present in the slag it has a great tendency to oxidize and form calcium sulphate ($CaSO_4$), which would act upon the metal as shown by the following equation and the sulphur would return to the bath:

$$CaSO_4 + 4Fe = FeS + 3FeO + CaO.$$

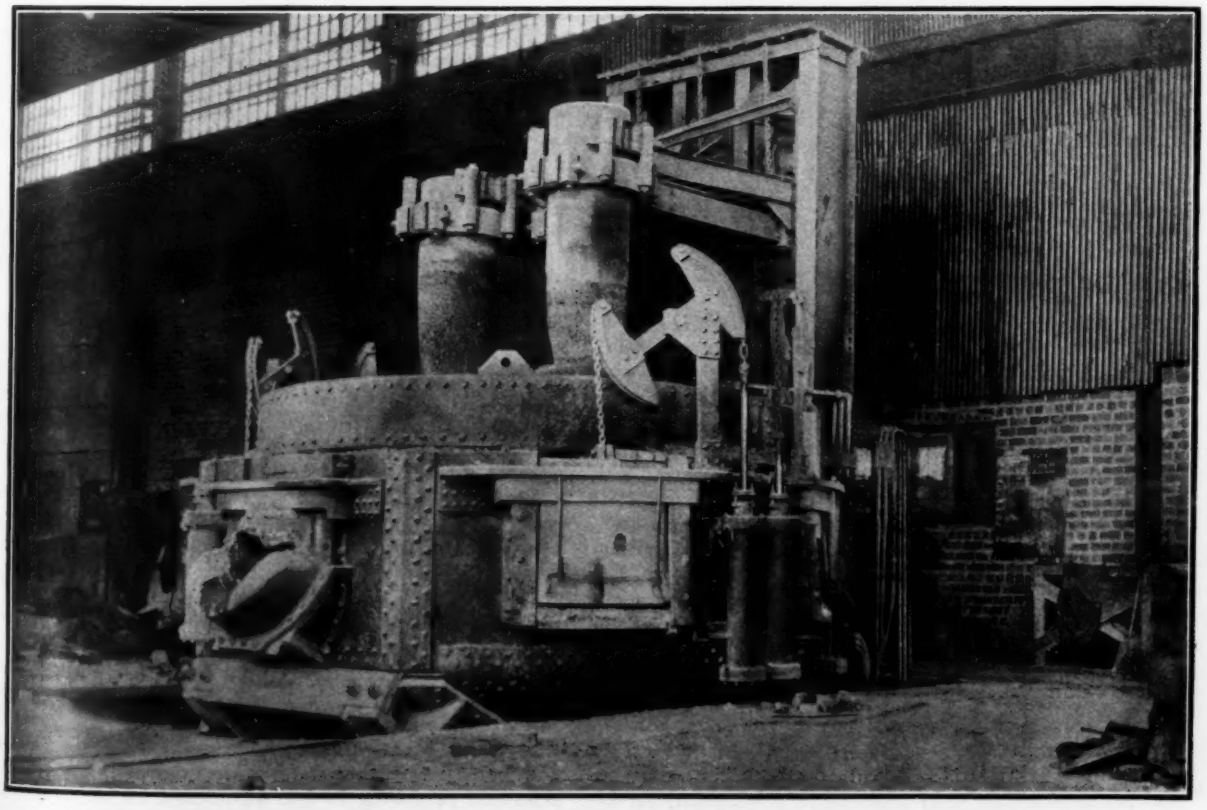
The conversion of iron sulphide (FeS) into calcium sulphide is probably due to the presence of calcium carbide, which, it is stated, forms spontaneously under the action of the electric arc.

The operation of desulphurization in the electric furnace is as follows: The bath is deoxidized by a strongly reducing slag which is formed on its surface, in such a way that metallic oxides in the slag are reduced to metal and return to the bath while the calcium carbide is oxidized to lime and carbon monoxide. After this reaction the slag acts on the metallic sulphides, reducing them in the process of forming calcium sulphide, as shown in the following equations:

$$FeS + C + CaO = CaS + Fe + CO.$$

$$MnS + C + CaO = CaS + Mn + CO.$$

The slag, which is white, disintegrates to a powder when exposed to the atmosphere.



A Six-Ton Three-Phase Heroult Furnace in a Steel Plant. Regulating Apparatus is on Panels Back of Furnace.

Professor Osann concluded, after experiments with a 2200-pound induction furnace, that an iron content in the slag prevents desulphurization of the steel bath. The following table shows the results obtained from one of the charges:

RESULTS OBTAINED WITH A 2200-POUND INDUCTION FURNACE.

	C.	Si.	Mn.	P.	S.
Analysis of bath after treatment with mill scale	0.105	0.016	0.204	0.012	0.069
Addition of 11 pounds of 50% ferro-silicon (egg size) and 33 pounds of coal. Slag made from 22 pounds of lime and 8.8 pounds of fluorspar. When slag was fluid the analysis of bath was	0.07	0.092	0.248	0.020	0.044
Addition of 11 pounds of lime, 4.4 pounds of 50% ferro-silicon (pea size) and 4.4 pounds of fluorspar thrown onto slag. Bath then analyzed	1.07	0.096	0.234	0.013	0.028
Slag was still too dark and another addition of 2.2 pounds of 50% ferro-silicon and 2.2 pounds of fluorspar was made. Slag was then lighter in color and the analysis of bath was	1.07	0.19	0.263	0.015	0.016
Another addition of 4.4 pounds of 50% ferro-silicon and 4.4 pounds of fluorspar. Slag has now become white. Analysis showed	1.05	0.25	0.263	0.016	0.008

Furnace was tilted and composition of last slag was as follows:

SiO	CaO	FeO	MnO	S	Fe
28.66	43.3	2.59	0.70	0.45	2.22

The analysis of slag during the oxidation and deoxidation periods probably indicates more clearly than by any other means the progress of the refining.

The following results are taken from the three-ton furnace, mentioned above, during the deoxidation period. The weight of the charge was 7050 pounds and the material, as stated, was molten open-hearth steel:

ANALYSES OF BATH DURING DEOXIDATION.

Furnace, three-ton Girod.
Material, 7050 pounds of molten open-hearth steel.

Sample.	C	Si	Mn	P	S
No. 1—After adding 52.8 pounds of petroleum coke and 110 pounds of refining slag	0.50	Trace	0.26	0.010	0.034
No. 2—Addition of 88 pounds of slag	0.50	Trace	0.26	0.010	0.038
No. 3—Addition of 66 pounds of slag	0.49	Trace	0.27	0.010	0.026
No. 4—Addition of 19.8 pounds of ferro-manganese	0.50	Trace	0.49	0.011	0.026
No. 5—Addition of 2.2 pounds of powdered petroleum coke and 11 pounds of ferro-silicon	0.52	0.07	0.52	0.015	0.026
No. 6—Addition of 11 pounds of ferro-silicon	0.52	0.14	0.52	0.012	0.018
No. 7—Addition of 8.8 pounds of ferro-manganese	0.56	0.14	0.61	0.015	0.010
No. 8—Refining complete	0.56	0.14	0.62	0.015	0.010

SOME ADVANTAGES OF ELECTRIC STEEL FURNACES.

The recognized practical advantages to be derived from the use of the electric furnace are fairly well covered in the following:

The facility offered in the process of melting or fusion of metal, refining it to any predetermined degree, which embraces dephosphorizing, desulphurizing and deoxidizing. These processes may be carried out with greater facility than by the older fuel methods; the furnaces are much less cumbersome and require much less floor space for equal capacity than other machines, the cost being equally as low or lower.

Electric steel produced from the cheapest and most ordinary materials compares favorably with crucible steel made from the purest and most expensive materials and the cost is considerably less than by the crucible process.

The electric furnace may be employed for small or large quantities and the heat regulation is entirely within the control of the operator, which is a desirable and important factor in reaching a predetermined result. For the production of specially high-grade steel and for steel castings it is unquestionably superior to other methods.

With the usual cost for electrical energy the electric furnace can replace the Martin furnace and the

A Three-Ton Three-Phase Snyder Furnace in Pouring Position, Showing Two Arc Electrodes at Top.

crucible, because the cost of operation is less. For making alloys and for liquifying manganese for use in the open-hearth furnaces it is ideal. It will be a factor in continuing the latter type of furnace in use. Gases and oxides in steel, which are so detrimental, may be easily removed and a perfectly homogeneous metal produced.

The loss of material in treatment is small, being but from one to five per cent. Electric steel is far more malleable when heated than are other steels. It is also finer in grain. Castings and forgings made from it are substantially free from flaws.

Engineering Experiment Station at Purdue.—Purdue University, at Lafayette, Ind., by authority of its Board of Trustees, has organized an Engineering Experiment Station, which will have charge of engineering research and investigation. The vast amount of data and information previously obtained and that has been given out from time to time in technical periodicals, in papers before scientific societies and university publications will now be made available and issued from the Engineering Experiment Station. The Experiment Station stands ready to undertake investigations and research in scientific matters that await solution, in co-operation with individuals or industrial concerns so long as the work is of general benefit to the community. The work of the station will not be that which comes under the classification of ordinary commercial work but the working out of industrial and scientific problems to the advantage of the state, the industrial world and mutual advantage of all.

Economies in Power-Plant Operation

Practical Suggestions for Increasing Boiler and Engine-Room Efficiency by Use of Proper Instruments and Operating Methods

By F. N. LAWTON

Manager, Wichita Falls (Tex.) Electric Company.

SUCCESSFUL station operation depends largely upon three things. First, the employment of high-class men who are capable of knowing the best results obtainable from the apparatus installed. Second, a complete outfit of instruments and recording meters to show what the apparatus is doing, and third, complete daily records of boiler-room and engine-room operation so that comparisons may be made and economies effected.

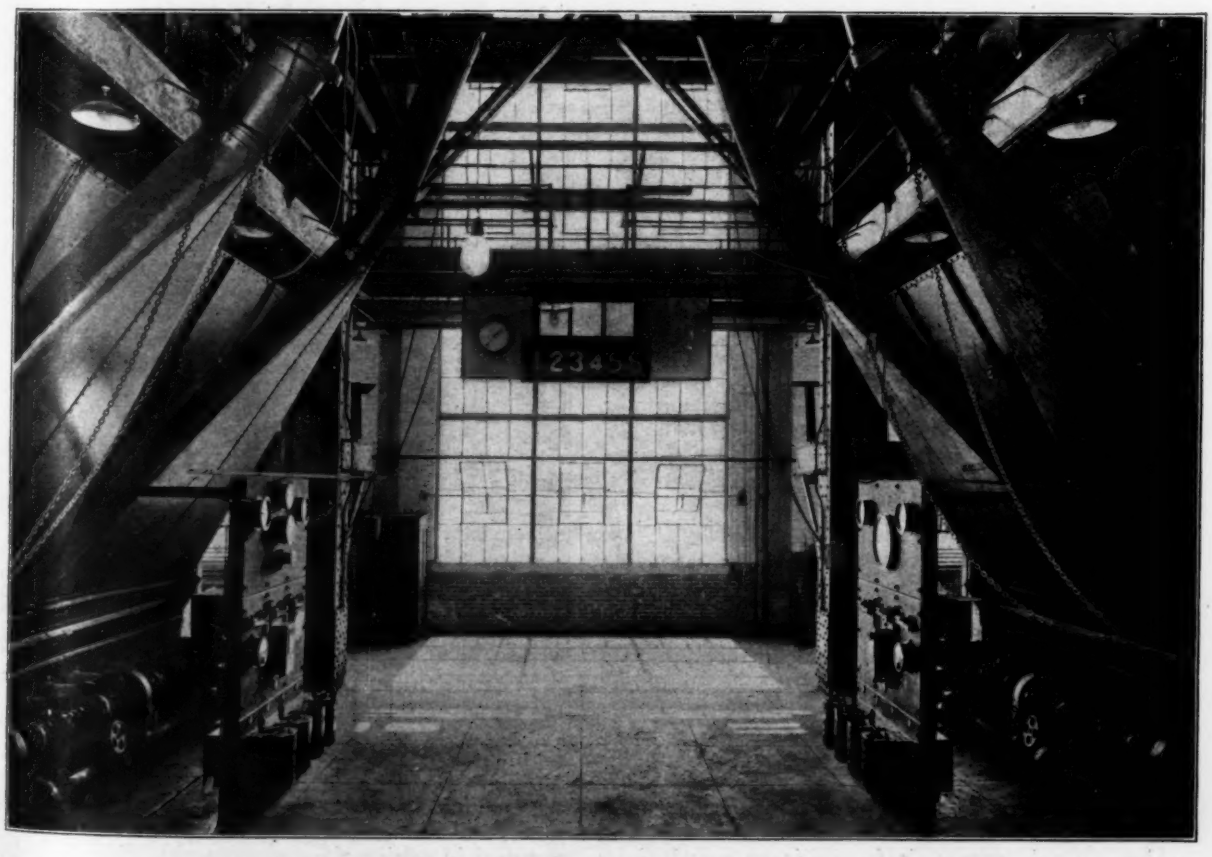
This article will discuss these three subjects. The employment of high-class men is warranted by the fact that a large amount of money is invested in the station, and also by the fact that the process of manufacture is very wasteful. A recent government report gives the losses in the average station as follows: Of the 100 per cent of the heat in the coal fired, about 43 per cent is lost in the boiler room, the remaining 57 per cent is actually used in making steam. The engine takes this 57 per cent of heat, rejects 43 per cent into the condenser, 4 per cent to its auxiliaries and the remaining 10 per cent converts into mechanical energy. Of this 10 per cent of heat converted into mechanical energy about 4 per cent is lost in friction and in the dynamo, leaving about 6 per cent of the heat energy of the coal to be made into electricity.

About 50 per cent of the above losses are non-preventable, due to unavoidable losses in stack, condenser, friction, etc., but about 50 per cent of the actual losses can be prevented, and it is this 50 per cent of our coal pile that we must try to save.

High-Grade Men Needed.

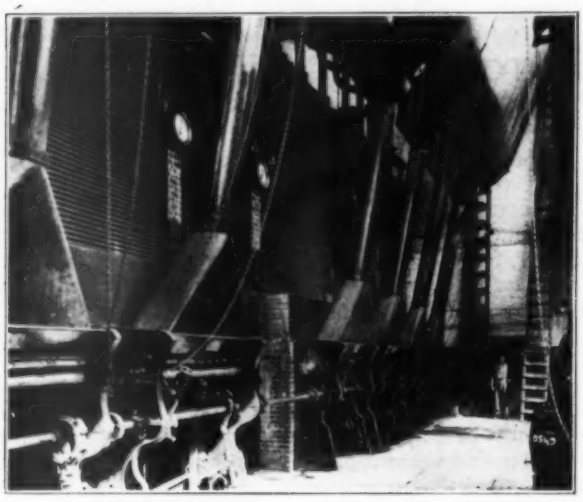
With such a purpose in mind and with such a great saving to be made, I believe it is the best kind of economy to employ first-class engineers and the best firemen that we can get. These men can lose or save more money than any other employees. I believe in good wages and in fair hours of work. No man can save the company any money by working twelve hours per day seven days in the week, as I have known station men to work. If possible, get married men who will learn the station and stay with you.

Make the station a comfortable place in which to work. Provide a wash room, soap, towels, shower baths, lockers, ice water, etc. A day off to visit other plants is often a good investment, as usually the men



View of Part of Boiler Room of Connors Creek Station of Detroit Edison Company, Detroit, Mich., Showing Instrument and Control Panels for Regulating These Big Boilers, Each of Which Is Rated 2365 Horsepower.

come back with some valuable idea picked up from the other fellow. None of us know it all, but all of us together know quite a heap. Provide instructive books for engineers and firemen, such books as treat



A Well Equipped Boiler Room With Mechanical Stokers, Coal and Ash-Handling Equipment. Plant of Thos. Wolstenholme & Sons Company, Philadelphia.

on boiler and engine-room practice, Rogers, Roper, Kent, Thompson, etc. Subscribe for power and electrical papers, etc. This keeps up the interest and gives the incentive to get better results from the apparatus. Books are always a good investment for every company, but how few companies ever supply their men with books that cost any real money!

Proper Instruments Essential.

Next in order we must have the proper instruments to locate the various losses in the station. The efficiency of the furnace depends largely upon proper draft. A thermometer should be placed on the feed-water heater, so that the water may be kept as hot as possible, in order to throw down the carbonates and sulphides of lime and magnesium and also to make a saving of 1 per cent for every 10 degrees we can raise the temperature of the water with our waste steam. The tubes and furnace must be kept clean. Soot is a non-conductor, one-fifth inch of soot being equal to one inch of fine asbestos. If necessary, soot cleaners should be installed in the boiler. The boiler must be kept free from scale. Use the best water obtainable. Deposit scale in the heater and not in the boiler, one-sixteenth inch of scale in the boiler means a loss of at least 12 per cent of the fuel burned.

It has often been said that while the spigot might be leaking in the engine room, the bung was surely out in the boiler house.

The greatest loss in the boiler room is occasioned by low CO_2 in the furnace gases, amounting frequently to between 20 and 30 per cent, and on this subject I will offer a few suggestions. Low CO_2 is induced by several causes. First, leaky boiler setting; second, a fire too thin; third, a fire too thick; fourth, holes in the fire; fifth, draft too strong; sixth, draft too light; seventh, grates plugged with ash or slag. A proper amount of draft is necessary, as insufficient draft causes incomplete combustion, but the greatest cause of low CO_2 is excess draft. This excess draft is drawn in through holes in the firebed, through the firedoor, over the fires, and through numerous cracks and holes in the boiler setting. Out of a total of 87 plants tested by a combustion engineer, the average excess air found was 300 per cent, equal to 5 per cent CO_2, or a loss in fuel of 22.7 per cent.

Use of Combustion Instruments.

I would recommend the installation of a differential draft gauge with extended scale or a "U" tube gauge on the front of each boiler, with a pipe leading to the furnace placed a few inches above the flames. Sometimes it is advisable to install two gauges, one to indicate the furnace draft and one to indicate the draft in the last pass of the boiler. The furnace gauge will indicate excessive draft when fires are too thick or clogged with clinker and ash, and insufficient draft when the fires are too thin or full of holes. The gauge piped to the last pass of the boiler will show excessive draft when the tubes are covered with soot, and will indicate insufficient draft when baffles are broken and gases are short-circuited.

Control draft with damper and not with ash-pit doors. Have a damper on each boiler and connected with a rod or chain leading to the side of the boiler near the front, so connected with a lever and rack that good regulation may be had. Operate the damper slowly, as sudden changes cause great fluctuations in efficiency. Install a thermometer on the stack. The temperature of the stack gases for steam at 125 pounds should be about 450 to 500 degrees. Keep this temperature as low as is consistent with good draft. One pound of carbon requires theoretically about 12 pounds of air to produce 14,600 British thermal units, but if one pound of carbon unites with only one-half of this quantity of air, only 4,450 British thermal units are produced, and the remaining 10,150 British thermal units remain unreleased in the CO and are carried up the stack and lost.

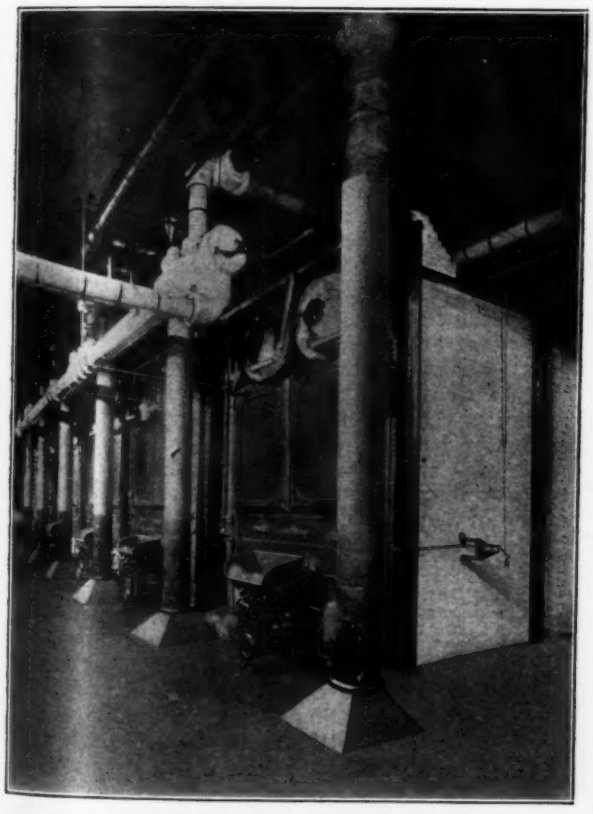
Boiler Room in Beacon Light Company's Station, Chester, Pa. Stoker and Regulating Equipment Convenient for Fireman.

In practice about 18 to 20 pounds of air are required to burn one pound of coal; excess air above this amount is very wasteful. It enters the furnace at atmospheric temperature, say at 80 degrees. The heat absorbed in raising the temperature of this air to 500 degrees may amount to 30 per cent of the total heat units in the coal fired, and is lost. We installed a 500-

horsepower Stirling boiler in our plant recently with new brick setting, but to our surprise we got only 10 per cent CO_2 while our 500-horsepower Heine boiler next to it was giving 14 per cent right along. This 4-per-cent loss in CO_2 means to us $1500 per year in fuel, or the wages of two firemen for one year. So we immediately located the trouble and got this boiler up to 14 per cent CO_2.

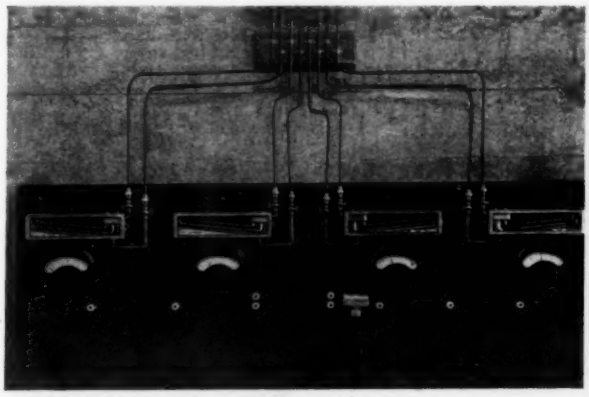
Inspect Boiler Setting Frequently.

This excess air which is so wasteful gets into the boiler through the grates when the firebed contains holes, comes in over the grates and through the many small holes and cracks which develop from day to day in the boiler setting and from contraction and expansion of the boiler in the brick setting. The best way to locate these leaks is with a candle or torch. Very frequent places for leaks are around the numerous clean-out doors, and over the rear brick arch where the boiler is apt to expand away from the brickwork, leaving a wide opening, and also around stay bolts and blow-off pipes. As these leaks occur from day to day, constant inspection is necessary. These leaks may be stopped by using asbestos rope and asbestos cement. We have our boiler settings entirely coated with a preparation of tar, so that all small cracks may be closed, and the result has been very satisfactory.



A Battery of Well Equipped Boilers in Plant of Kirkman & Sons, Brooklyn, N. Y.

This tar is heated and put on hot. For efficient operation of the boiler I believe a CO_2 recorder to be absolutely necessary. The initial cost and the delicacy of these instruments has prevented their general adoption. They cost from $250 to $325, and the smaller stations have not adopted them, but to my mind they will soon pay for themselves in any station. It is just as necessary to have this instrument in the boiler room as to have an engine indicator in the engine room. This instrument is the watchdog of the boiler room and will save its owner many a dollar by keeping



Draft Gauges and Flue-Gas Pyrometers Conveniently Installed in a Boiler Room to Promote Efficient Operation.

away the thieving losses that would steal his coal pile. When the CO_2 recorder is first installed it is not unusual to get a reading of 5 per cent CO_2 which means that 300 per cent excess cold air has been heated above requirements, and that the fuel loss for the past years has been about 23 per cent. This condition can be brought up to 14 per cent CO_2 where the preventable loss will be only 8 per cent by locating leaks and careful firing.

When the CO_2 recorder has indicated the proper strength of draft to carry and the proper depth to carry the coal, marks should be placed upon the draft gauge and the firedoors, so that the firemen may be guided in their work.

In some stations a daily bonus is given the firemen for high CO_2, 75 cents for 12 per cent, 70 cents for 11.5 per cent, 65 cents for 11 per cent, etc.

Efficiency in the boiler depends largely upon proper draft and recently some inexpensive boiler-efficiency meters with a large scale have been put on the market. This meter is installed on the front of the boiler and tells the firemen plainly when the efficiency is high or low. A recent publication of the Bureau of Mines, entitled "Hand Firing Soft Coal Under Power Plant Boilers," and known as Technical Paper No. 80, may be had for the asking, and should be placed in the hands of every fireman.

Engine-Room Losses.

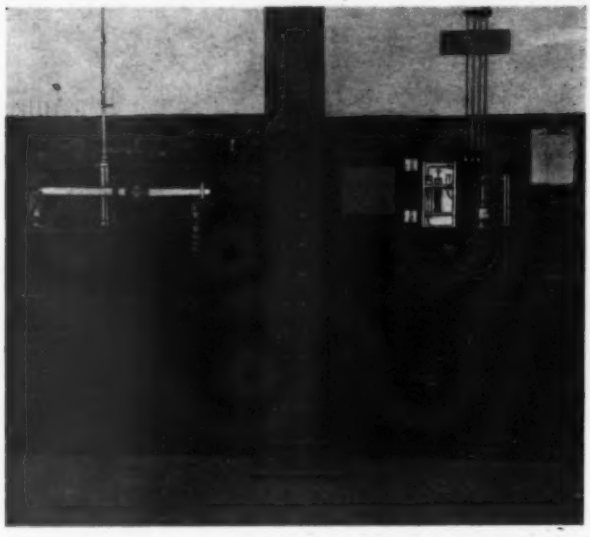
Losses in the engine room are somewhat harder to locate, but the losses due to radiation from uncovered and poorly covered steam pipes may be mentioned. These losses amount to about 600 British thermal units per square foot of bare pipe per hour.

The engineer should by all means be provided with a steam indicator, so that he may be able to set his engine valves frequently. Once or twice a year is not enough.

Valves should be indicated at least every month. Frequently a saving of 15 per cent may be made by accurate setting of the valves. Valves are apt to slip, due to heavy and irregular loads, water coming over from the boiler, etc. Frequently an engineer can save his salary by accurate setting of the valves. Many plants try to economize along without a steam indicator, but this is surely false economy.

Next in order we must have complete records, kept

up daily, showing the operation of the entire station. The daily log should show the weight of the coal and ash, the water evaporated per pound of fuel, the British thermal units per kilowatt-hour, the temperature of the boiler-feed water, the vacuum carried, time boilers are on or off, space to show a graphic chart of peak load plotted hourly, readings of recording wattmeters on outgoing circuits, totalizing meter, etc. A monthly report showing these various readings from day to day will show up any irregularity in operation and prove very valuable to the manager in determining the cost of the kilowatt-hour generated.



Automatic Draft Regulator, CO_2 Recorder, and Log Sheets for Securing Boiler-Room Economy.

Above all things in the operation of the station, a good organization should be perfected. Joseph W. Hays says: "Where nobody reports to anybody about anything and nobody is made responsible for anything, nothing may be expected because nobody is interested." Adopt the army plan and have each man responsible for his particular work and accountable to one higher in authority. Make the firemen responsible for the coal passers, the engineers responsible for the firemen and the chief engineer responsible for the operation of the entire plant. Let him hire and discharge his own men. Make every employee realize that his work is an important link in the chain. A few words of appreciation and encouragement in the station go a long way in the hard and tiresome daily fight against depreciation, repairs, accidents and the entire army of insidious losses that surround the station, ready at all times to attack whenever they see the guards asleep at their posts.

The daily watchword at the station should be vigilance, and the victory will be to those who are prepared with knowledge, armed with instruments and records, and who have the loyalty and pep for each little b. t. u. in the coal pile as it makes its long and dangerous journey from the coal pile to become a valuable kilowatt-hour on the switchboard.

Electric Trainmen's Strike at Akron Settled.

By the terms of a new agreement between the Northern Ohio Traction & Light Company, Akron, Ohio, and its trainmen, all differences over wages and working conditions will hereafter be settled by arbitration. On November 12, the trainmen on the northern division of the line, including the city lines of Akron, went on strike for an advance in wages of 10 cents an hour. Recognizing the fact that the cost of living had advanced to the point where the existing wages were insufficient, General Manager A. C. Blinn offered the trainmen an increase of 3 cents per hour until May 1, 1918, and a further increase of 2 cents per hour for the year succeeding. This offer was rejected, as was a later one for a 5-cent increase to begin November 1 and continue until May 1, 1919. No attempt was made by the company to run cars during the subsequent period of negotiations. As a result, there was no disorder of any kind and no occasion for making any arrests on account of the tie-up. On the advice of national union officials, the men decided to accept an increase of 5 cents per hour until May 1, 1918, the matter to be again opened for negotiation a month earlier. All questions upon which the company and the men are unable to agree are to be submitted to arbitration hereafter.

Public sentiment, at first with the trainmen, shifted during the five days of the tie-up, when it was discovered that the company intended to play fair with the men and to do all it could, in reason, to meet their demands. The weather was good during the whole period and the public good naturedly walked or found other means of transportation. The local newspapers emphatically commended the policy of the company throughout, both for its patience and forbearance in dealing with the men and its refusal to precipitate trouble by attempting to run cars.

Tube Prices Lower.

Conferences of manufacturers of lap-welded steel and standard charcoal iron tubes have been held in New York City to review the present situation and to adopt new discounts which will show very much lower prices than those in effect for a long time.

At the same time the Government has announced discounts of 52 and 5 and 2½ per cent on ¾-inch to 3-inch black steel pipe, which means a list discount of 51 per cent and an extra discount of 1 point and 5 and 2½ per cent to the largest jobbing trade. Basing this card discount at 51 per cent, it means a straight advance of $8 per ton in prices, which have been 55 per cent off based on the card of April 2 last. On the May 1 card, which is still in use by most of the independent mills, the new Government prices show a reduction of $4 per ton. All the manufacturers of steel pipe will send out new discount cards on which discounts have been extended two points, or a reduction of $4 per ton. The manufacturers of iron pipe have decided that for the time being they will adhere to the present discounts on both black and galvanized iron pipe, but will send out new cards, reaffirming the May 1 discounts, the new cards to be dated as in effect from November 7. The action of the Government now puts the price of black and galvanized iron and steel pipe on a standard basis of discounts, a condition that has not existed in the pipe trade for some months, there having been for some time no less than three separate discount cards that were being used.

Power Supply to Minnesota Farmers Increased.

The Northern States Power Company is adding a considerable farm power business to its lines. The latest development in this character of business is on the Watson-Montevideo (Minn.) transmission line, to which four farms have just been connected for light and power service.

Economy of Automatic Combustion Control

Accurate and Reliable Combustion Control Obtained Automatically Will Do Much to Conserve the Coal Supply, Lower the Coal Bill and Lessen Difficulties of Labor Situation

By I. L. KENTISH-RANKIN

THE consumer of coal for any purpose, whether for steam or gas making, or general heating purposes, is placed in a very serious dilemma at this time on account of the scarcity of available coal. Coal is in many localities hardly obtainable, whilst in others only relatively small quantities can be obtained, and often at prohibitive prices. Even now the Government is understood to have under advisement stopping or restricting the use of coal by industries not actually engaged in making materials necessary for the prosecution of the war or the maintenance of life.

It is obviously too late now to discuss the wisdom and methods of storing coal, the measures for preventing loss due to weathering and spontaneous combustion and germane topics to useful purpose, as the time is now past when coal other than that barely sufficient to meet curtailed demands can be obtained. To accomplish results at this time attention must be centered, and with concentrated and intensive effort, upon the ways and means of using every bit of coal of good and bad quality to best advantage, thus conserving the available supply by reducing the consumption and thereby relieving suffering amongst the poor, mitigating congestion of terminals and tracks and serving the nation as a whole.

Enormous Waste of Coal Due to Inefficient Use.

Director V. H. Manning of the Bureau of Mines has recently stated, in his appeal to the nation to alleviate the shortage of coal, that 25 per cent of the 600,000,000 tons of coal annually produced in this country, a matter of 150,000,000 tons, is wasted on account of inefficient use. Of this vast amount about 65 per cent is fired by some 250,000 firemen in power houses and on the railroads, compared with 20 per cent handled by the masses for domestic purposes. In view of these startling facts it can be readily seen that it is in the power houses, and the smaller ones especially, that the nation must look for any appreciable and influential move toward the less wasteful use of coal. The largest steam-making plants can do not a little to save coal, without a doubt. But the smaller plants can do even more, because though their consumption is less than the large plants individually, it is larger in the aggregate and their losses are relatively greater. Any coal-burning plant, from the smallest to the largest, that at this time makes serious endeavor to save coal will serve itself as also the country.

In endeavoring to obtain higher economies in the boiler room there is a rather natural human tendency to strive for those things which are most expensive and difficult to obtain and necessitating radical changes instead of turning to those things within easy reach, if not actually at hand, and which can be simply and quickly employed. Unfortunately, this seems typical in and around boiler rooms.

In the boiler room there are unavoidable losses that can usually be very much reduced but never entirely eliminated. There are avoidable losses in apparatus and the manner of using it. And then again there are the losses, perhaps the largest of them all, due to the personal element, some chargeable to carelessness, some to ignorance, some to lack of conscientiousness, some to improper or insufficient equipment, and some again due to the wrong man in the wrong place. A boiler room cannot be remodelled over night with the apparatus on hand, even where the spirit is willing, which unfortunately till quite recently has rarely been the case. But with the country in the throes of war, apparatus is difficult if not impossible to obtain, and then only after long delay and at a price that places patriotism at great handicap amongst many of the smaller plants where the margin between economies and initial cost are small. Attention for many plants must therefore turn to considerations of the personal equation, which after all for a station containing any sort of equipment is the controlling factor. Even in the largest station it might be waste of money to invest in new equipment until some assurance has been obtained that that which is being used is operated to best advantage.

Replacing Human Control by Mechanical Control.

The tendency of the times in boiler-room practice, as elsewhere where standardization and uniformity of results long sustained is vitally important, is to replace human effort with mechanical performance wherever feasible. Thus in and around the boiler room the mechanical coal and ash conveyors have replaced gangs of men. The mechanical stoker feeds the largest furnaces at any and all ratings with ease, eliminating the numerous coal shovellers and a dirty, dusty boiler room. The self-shaking grate, the rotating intake screen, the mechanical soot cleaner for boiler and economizer, and other devices, all reliable, untiring, economical and efficient, are taking the place of wasteful, erratic manual labor. It must be so, on the score of efficiency and economy, because of the intensive effort or high rate of work that is now in vogue and becoming more intense, because of the need for low maintenance charges at high outputs, and last but not least important because of the necessity for uniform sustained performance according to predetermined requirements. Yet, notwithstanding the rapid advance in the use of mechanically operated and automatically controlled contrivances and apparatus for eliminating the personal equation from so many applications in the boiler room, the most important of all the functions performed in the use of coal still remains in the majority of steam-making plants in the hands of the firemen and subject to their whims and caprice. That one function is the air supply, the draft,

the air that must be supplied to the coal to make it burn for greatest heat, for most smoke, and so forth, depending whether the right or the wrong amount is supplied for the requirements of the coal. In these days of scientific methods it seems strange indeed that the most important factor in combustion efficiencies and economy of fuel should be subject to control by firemen, whose ability and characteristics are often a variable and unknown quantity. It is the 250,000 firemen that are responsible for 65 per cent of the nation's 150,000,000 tons wasted annually, remember.

The labor situation at present is attracting nation-wide attention. Labor is scarce, and throughout the land there is a call for every kind of labor, unskilled as well as skilled. Many have answered generously to the country's call; others have deserted one field of effort for some other, pleasanter, easier, better-paid means of livelihood. Thus everywhere is the keen demand for labor whilst the price for labor rises, and only those jobs that tempt find their demand satisfied. Many men have been lost to the boiler rooms in this way, leaving their tasks to be done by others less skilled, or left undone, to the detriment of apparatus and economies. Every act and function that can be performed automatically and mechanically by machinery instead of by manual labor or mental effort is now finding great demand, and eager listeners welcome suggestions as to how to overcome the labor situation with its unreliability. The automatic control of furnace draft thus assumes more than ordinary interest at this time, because it eliminates the necessity of placing the combustion of the coal pile into the hands of men who may or may not know how to accomplish it properly.

It has been claimed that food and fuel will win the war. Thus coal assumes a higher intrinsic and economic value, which makes it even more imperative, if possible, to obtain the maximum economy of its usage by using every bit to full advantage for selfish as well as patriotic reasons. Mechanical draft control, accomplished automatically, and if installed properly and with the best equipment obtainable, will render the highest combustion efficiencies compatible with continuous performance, and independent of the vicissitudes of the personal equation.

Briefly, the above represents the fuel and labor situation as it exists in thousands of boiler plants throughout the country. There is only one answer to this situation, since it is not feasible to educate the firemen nor pay them what they would be worth were they educated in the theory and practice of combustion. That is to remove combustion control from them and make it automatic.

An example of the way in which one plant overcame its labor and fuel troubles by substituting the balanced-draft method of draft control for erratic hand control may therefore be of interest, more especially since it has enabled a saving in the coal bill of 37.8 per cent ever since its adoption. This matter will be treated in a future issue.

RAPID PROGRESS IN ELECTRIC COOKING IN SWITZERLAND.

Technical Report Attests the Ruggedness and Efficiency of Appliances.

Electric heating and cooking have made more progress, comparatively, in Switzerland than in any other European country, according to a report prepared by the Swiss Electrotechnischer Verein on the present position of electrical cooking apparatus in that country. Electrical energy is largely derived there from hydroelectric plants, and as the war has made it difficult to import coal into the country a great stimulus has been given to electric cooking. The report issued is based upon (1) a series of laboratory tests made on apparatus now on the market, and (2) on the results of a series of inquiries from electrical supply companies. Replies were received from 28 works, representing a total load of 220,000 kilowatts in the year 1914, and supplying 115,400 customers.

The report states that in the durability of cooking apparatus great improvements have been effected, particularly as regards irons. In the laboratory tests for durability actual working conditions were simulated as nearly as possible; the apparatus was used periodically at cooking temperature, allowed to cool and again heated, and at the same time the voltage was progressively increased to much above the normal, thus making the test very much more severe than occurs in practice. As regards the durability of the heating element and its immediate accessories it was deduced that, even when subjected to a double load, cookers lasted for 2 to 10 years, frying pans for 2 to 4 years, cooking plates for 1 to 2 years, irons for 2 to 8 years. The term cooker relates to any apparatus employed for culinary purposes in which boiling is involved. These periods indicate time after which a defect was revealed, but it must be noted that ordinarily durability would extend to double the time. An additional test of the durability of a series of irons, cooking pots, frying pans, cooking plates and quick-heating appliances took the form of continuous heating, dry, and without cooling periods. With exception of the quick heaters, which are not intended for continuous work, the apparatus stood the test without revealing any defect for over two weeks, actually about 425 hours. The temperatures measured on the outer surfaces of the articles ranged from 360 to 550 degrees.

The report points out that although asbestos is the insulating material usually employed it tends to deteriorate in the moist atmosphere of the kitchen and to lose its insulating power; mica is therefore a better substance to use. In the case of most apparatus various signs of insufficient insulation, such as cracking and small internal discharges, began at about 2000 volts, but no permanent discharge occurred during a five-minute exposure to 1500 volts (in the case of irons, 2000 volts). In view of the danger of shocks in handling badly insulated cooking apparatus, special precautions should be taken in the way of testing at 1500 instead of 1000 volts. When there are complaints of short-circuiting in the heating element of cooking pots the trouble is usually due to the entry of moisture where the wires are led into the heating element. Where the connecting wires are brought to bare terminals, and no precautions are taken to insure that these are tightly and safely screwed up, wires readily become loose and short-circuits occur. The proper insulation of parts of cooking implements involving continual exposure to high temperatures is one of the chief difficulties not yet completely solved.

In the course of tests rapid heaters were found to have a working efficiency of 78 to 87 per cent, and an efficiency in continuous cooking of 85 to 90 per cent; cooking pots, 70 to 81 per cent and 80 to 89 per cent, respectively; and cooking plates, 40 to 65 per cent and 70 to 80 per cent, respectively. There is little scope for diminution in the heat capacity of cooking vessels, as their mass has been reduced to the limit.

The Magnetic Circuit—IV

Calculating the Ampere-Turns for Parts of a Circuit—Precautions in Making Magnetic Computations in Iron—Other Important Magnetic Relations

By TERRELL CROFT

This is the fourth section of an article appearing in five parts and giving for non-technical readers a simple explanation of the principal phenomena and laws of the magnetic circuit. This section continues the discussion of the fundamental facts and by means of examples introduces the calculation and design of simple magnetic circuits, which will be taken up in further detail in the next or concluding section.

IN the practical design of magnetic circuits the total flux ϕ is usually known or assumed. The problem is then to lay out a circuit which will carry this flux effectively and to compute the ampere-turns necessary for its development in the magnetic circuit. The general proportions of the circuit are tentatively assumed, the dimensions being based on previous experience and trial calculations. An examination of similar magnetic circuits already in successful operations will be of assistance. The cross-sectional area of the magnetic path of the iron in the circuit must be so selected that the iron will not be oversaturated. There is no direct method of designing a magnetic circuit. The first tentative plan is developed to a conclusion and, if it does not work out as desired, it must then be altered and recalculated accordingly. Because permeability varies with the saturation it is almost impossible to effectively design magnetic circuits without consulting data similar to those in Table *I* (page 930, issue of December 1, 1917).

In the practical calculation of magnetic circuits it is, as above suggested, often necessary to determine the ampere-turns, $I \times N$, that would drive a certain flux ϕ through the circuit. In solving such problems formula (26) $I \times N = (\phi \times l) \div (\mu \times A)$ might be used in the form just given. However, it is usually more convenient to compute on the basis of the flux density, that is, on the basis of the number of lines per square inch cross section in the magnetic circuit, because tabular data like that in Table *I* can be most conveniently compiled on this basis. Furthermore, it is often inconvenient to make the computation for a complete magnetic circuit in one calculation. It is usually more practical to consider the component parts of the circuit, one part at a time, that is, to compute the ampere-turns necessary to develop the required flux in each part. After the ampere-turns necessary to force the flux through each of the parts has been figured, these component ampere-turn values are totaled. The resulting total will then be the number of ampere-turns required to force the flux through the entire circuit. The following examples illustrate the process.

Examples of Calculations of Ampere-Turns.

How many ampere-turns will be required to develop a flux of 400,000 lines in the magnetic circuit of Fig. 17, *I*. Solution.—Consider the component parts of the circuit one at a time. First consider:

The wrought-iron yoke, which has a sectional area of $2 \times 2 = 4$ square inches. Therefore, if the total flux is to be 400,000 lines, the flux density or lines per square inch will be: $400{,}000 \div 4 = 100{,}000$ lines per square inch. Now, Table *I* shows that, in wrought iron, with a flux density of 100,000 lines (100 kilolines) per square inch the magnetomotive-force gradient is 134.7; that is, there would be required 134.7 ampere-turns per inch length of the magnetic circuit to produce a flux density of 100,000 lines. Hence, the ampere-turns required to magnetize the 20-inch yoke to the specified flux density would be: $20 \times 134.7 = 2694$ ampere-turns.

The air gaps are each one-eighth inch long and, it will be assumed, are 2.25 inches square. The lines of force spread out at an air gap and will there occupy a cross-sectional area greater than that of the iron yoke. Hence, the area of the magnetic circuit at the air gap is: $2.25 \times 2.25 = 5+$ square inches. The flux density in the air gap is: $400{,}000 \div 5 = 80{,}000$ lines per square inch. From Table *II* (page 931, issue of December 1, 1917) to produce a flux density of 80,000, the ampere-turns per inch length would be 25,080. For the one-eighth-inch air gap there would be required: $25{,}080 \div 8 = 3134$ ampere-turns. Then for the two one-eighth-inch air gaps: $2 \times 3134 = 6268$ ampere-turns are necessary.

The cast-iron armature has a section area of $4 \times 2 = 8$ square inches. Hence, the flux density in it is: $400{,}000 \div 8 = 50{,}000$ lines per square inch. From Table *I*, to produce a flux density of 50,000 lines in cast iron requires 134 ampere-turns per inch length of the magnetic circuit; hence, to magnetize this 20-inch-long yoke there will be required: $134 \times 20 = 2680$ ampere-turns.

Totaling the ampere-turns required for the different parts:

Wrought-iron yoke	2,694	ampere-turns
Two air gaps	6,268	ampere-turns
Cast-iron armature	2,680	ampere-turns
Total	11,642	ampere-turns

Therefore 11,642 ampere-turns are necessary to drive a flux of 400,000 lines through the magnetic circuit shown in Fig. 17, *I*.

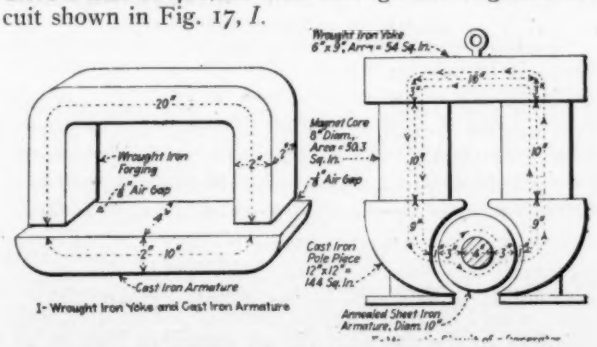


Fig. 17.—Two Examples in Calculating Magnetic Circuits.

As another example, how many ampere-turns will be required to develop a flux of 4 megalines (4,000,000) in the magnetic circuit of the generator of Fig. 17, *II*. Solution.—Only the general principles will be illustrated. It is not practicable to consider here the details of electrical machine design, which is a very complicated subject. Consider the machine a part at a time:

The wrought-iron yoke has an area of 54 square inches. Hence, the flux density in it is: 4,000,000 ÷ 54 = 74,000 lines per square inch, say 70,000 lines per square inch. To produce this flux density in wrought iron (Table *I*) 20.4 ampere-turns are necessary for each inch length of the magnetic circuit. Hence, for the 22-inch magnetic circuit of this example: 20.4 × 22 = 449 ampere-turns are necessary.

Of the magnet cores, each has an area of 50.3 square inches. The flux density = 4,000,000 ÷ 50.3 = 79,000, say 80,000, lines per square inch. The number of ampere-turns per inch length for this density in wrought iron is 32.6. The length of core = 10 inches. Then the ampere-turns required for each core must be: 32.6 × 10 = 326. Hence, for both cores there would be required: 2 × 326 = 652 ampere-turns.

The pole pieces are of cast iron. Area = 144 square inches. Flux density = 4,000,000 ÷ 144 = 27,800, say 30,000, lines per square inch. For cast iron at this density 51.4 ampere-turns per inch length are required. Length of magnetic path = 9 inches. Then ampere-turns required for each pole piece: 9 × 51.4 = 462.6. Then to magnetize both pole pieces there would be required: 2 × 462.6 = 925.2 ampere-turns.

In calculating for the air gap, assume the magnetic circuit comprises one-third of the circumference at each side of the armature. The armature has a diameter of 11 inches. Circumference of an 11-inch circle = 34.5 inches. Then ⅓ × 34.5 = 11.5 inches. Since the length of each pole face is 12 inches, each air gap has an area of 12 inches × 11.5 inches = 138 square inches. To compute the ampere-turns required to excite this air gap we may either use the values of Table *II* or formula (26), thus: $I \times N = (\phi \times l) \div (\mu \times A) = (4{,}000{,}000 \times 1) \div (3.19 \times 138) = 9091$ ampere-turns. For the two air gaps there would be required: 2 × 9091 = 18,182 ampere-turns.

For the armature iron there is to be used carbon sheet steel, sometimes called annealed sheet iron. The area = 6 × 12 = 72 square inches. The shaft area is subtracted because the steel in the shaft is considered ineffective. The flux density is: 4,000,000 ÷ 72 = 55,000, say 60,000, lines per square inch. It requires for sheet steel 16.6 ampere-turns per inch length of magnetic circuit to produce a density of 60,000 lines per square inch. The average path of the magnetic circuit through this armature is 9 inches long. Therefore, there are required for magnetizing the armature: 9 × 16.6 = 149.4 ampere-turns.

Totaling the ampere-turns required for the different parts of this machine:

Wrought-iron yoke	449 ampere-turns
Two magnet cores	652 ampere-turns
Two pole pieces	925 ampere-turns
Two air gaps	18,182 ampere-turns
Armature iron	149 ampere-turns
Total	20,357 ampere-turns

Therefore, if there were no leakage, 20,357 ampere-turns would be necessary to develop a flux of 4,000,000 lines in the magnetic circuit shown in Fig. 17, *II*. In practice a correction would be made for leakage. The winding on one of the magnet cores would furnish one-half of the required ampere-turns and the one on the other core should furnish the other half.

Precautions in Magnetic Circuit Calculations.

The difficulties encountered in calculating magnetic circuits should be considered. Magnetic circuits cannot be computed with the same exactness as can electric circuits because of two conditions:

First, magnetic leakage must be considered; it is impossible to confine a magnetic flux to certain paths as we can confine an electric current. It is possible to compute, with accuracy, the magnetomotive force that a given helix will develop. But it is not, because of leakage, possible to compute exactly, the effective flux that this force will push through a magnetic circuit.

Second, as hereinbefore suggested, the reluctance of iron and its permeability varies with its saturation.

The permissible flux densities in magnetic circuits should not be exceeded. As a general proposition, the cross-sectional area of any portion of a magnetic circuit should be so proportioned that the flux density in it will be such that the iron in it is worked somewhat below its saturation point. For average work with grades of iron ordinarily obtainable (Table *I* and Fig. 14, see issue of December 1), the flux density should not exceed about 110,000 lines per square inch for annealed sheet iron; 90,000 per square inch for unannealed cast steel and wrought-iron forgings and 50,000 lines per square inch for gray cast iron.

Relations Between Density, Gradient and Permeability.

The relations between flux density (B), magnetic gradient (H) and permeability (μ) may be expressed by the following formulas, the derivation of which is given below:

(33) $H = B \div \mu$ (ampere-turns per inch length)
(34) $B = \mu \times H$ (lines per square inch)
(35) $\mu = B \div H$ (perms per inch cube)

or substituting ν, which equals $1 \div \mu$, for μ in the above formulas:

(36) $H = B \times \nu$ (ampere-turns per inch length)
(37) $B = H \div \nu$ (lines per square inch)
(38) $\nu = H \div B$ (rels per inch cube)

As Karapetoff suggests in his "The Magnetic Circuit," formulas (33) and (34) state Ohm's law for a unit magnetic path, for instance, a path one inch long and one square inch in cross-sectional area. H is the magnetomotive force between the opposite faces of the cube, μ is the permeance (permeance and permeability are of the same value for a one-inch cube) of the cube and B is the flux passing through the cube.

The derivation of the above equations is this: Again we start with the fundamental equation (7), thus:

(*a*) $M = R^1 \times \phi$

Now since $\nu = 1 \div \mu$, from (9) $R^1 = l \div (A \times \mu)$. Also, from (24) $\phi = A \times B$. Then substituting these values for R^1 and ϕ in the above equation (*a*):

$$(b)\ M = \frac{l}{A \times \mu} \times (A \times B) = \frac{l \times A \times B}{A \times \mu} = \frac{l \times B}{\mu}$$

Therefore, dividing both sides of the equation by l:

(*c*) $M \div l = B \div \mu$

But, from (20), $M \div l = H$; then substituting this new value for $M \div l$ in the above:

(*d*) $H = B \div \mu$

(To be concluded.)

Editorial Comment

Vital Problems of Today

THE shipping problem is vital, and not only must be quickly solved from a military point of view but it is the chief retarding factor in the business situation and more especially in releasing money and credits. It will be solved and in a few months, but a few weeks is a long time when the welfare of the country is at stake.

Necessarily the intimate knowledge of many of the difficulties which this Government is encountering—and shipping is probably the most serious—is a big factor in causing a feeling of depression in the East, and more especially at the seaboard points. In the West people generally have no idea of the handicap under which the Government is working. The West must awaken to this and, more especially, manufacturers must be brought to an understanding of the importance of concerted and uninterrupted effort.

There must be also, from the labor standpoint, an absolute elimination of strikes. This is just as essential to the labor interests as to any other, being necessary to self-preservation and the proper support of our allies.

Scarcity of labor affords another menacing problem which is certain to become worse rather than improve. The selective conscription has drawn on the most virile working element of the country, and will continue to do so. When an army of several million men is raised, it is obvious that the withdrawal of such a quota from industrial, scientific, inventive and other valued lines of effort is a serious problem.

Both labor and capital are beginning to realize that this war calls for self-denial and the laying aside of self-interest. In the case of the former, there is very good evidence of a broader fellow-feeling and a willingness to give and take in the results of the recent conference between our President and the railroad labor chiefs. And the men who represent capital are not to be outdone in co-operative effort. Men of large affairs are giving of their time unstintedly and without remuneration. The resources of the manufacturing companies, public service companies and other business organizations which they represent are rapidly being made subservient to the requirements of the Government.

Not all the vital problems are as yet solved; they are so numerous and so intricate, they have come upon us so suddenly—practically like an avalanche. But, happily, they are in process of being solved much more rapidly than in the case of those of our allies in the early days of the war. We have learned so much from their experience.

There is just one kind of movement that labor or capital, individual or Government can make conscientiously at this time, and that is a movement FOR AMERICA. And the ELECTRICAL REVIEW stands squarely back of every such movement with all the influence it can exert.

Improving the Boiler Room

IN recent months the boiler room and various methods for improving its performance have received nation-wide attention. There are, of course, many things that can be done in almost every boiler room without exception to reduce losses and increase efficiency. Some of these may be accomplished easily and at small expense. Others again cost money and may be considered as radical changes that should be undertaken only after due consideration by competent engineers. Nothing that can be done to assure improvement should be left undone at this time, however, and the ease with which so many things can be done makes them if anything all the more desirable.

In too many instances neither the boiler room itself, the equipment or those operating it are suited to the purpose. Too many boiler rooms are operated upon neither sound engineering nor business principles, terms that should be synonymous but frequently are not. Boiler-room performance should be considered as a business proposition, and that it is not is perhaps the chief cause of inefficiency. Maximum results with a minimum expense, is business. The methods for accomplishing it, is engineering. Both must go hand in hand for success.

For best results apparatus should be chosen for the express purpose in hand. The best equipment cannot justify itself, however, in ignorant or careless hands, or where no means is furnished to indicate what results are being obtained. No one can work efficiently in the dark, without knowing what he is doing, or the results obtaining. Slowly perhaps, but none the less surely, boiler rooms are coming to realize the necessity of maintaining records and using them for purposes of comparison from day to day. Records are possible only by the use of instruments, and their interpretation by persons capable of understanding them. Perhaps too many instruments are preferable to too few, though the happy medium is best.

Watchfulness on the part of the boiler-room force, and the installation of instruments that enable them to be watchful effectively will go a very long way toward making more heat from less coal, and wasting less heat needlessly. The CO_2 recorder and the steam-flow meter—the watchdogs of the boiler room—will make for higher combustion and boiler efficiencies by indicating combustion troubles and dirty heating surfaces;

the coal-weighing apparatus, that weighs directly or indirectly—the cash register of the coal pile—is at last finding its way into many boiler plants to good purpose; liberal use of the water column for keeping tab on the air passages, the fuel bed and the settings; thermometers for recording stack temperatures; these are the instruments that can be easily obtained at comparatively small expense, small compared to the saving incident to their use, and used without costly changes in equipment or boiler room.

Labor should be chosen with the same degree of care that machinery is chosen, for the latter is largely dependent upon the former for use or abuse. Prevention is always better than cure, and the use of capable labor in the boiler room may prevent many of the losses and much of the expense now charged against coal or apparatus or whatever will stand the charge. Apparatus is usually chosen with care, yet the men to run it are often chosen haphazard, without sufficient recognition as to their past experience or their ability to develop in the future, instead of deliberately, remembering that it is the co-ordination of men and machines that makes possible the maximum economy. Effort should be made to retain skilled labor, when found. Make the boiler room a place fit to live in, that is properly illuminated and ventilated; furnish lockers and chairs, towels and soap and cool filtered drinking water for the comfort and health of the men. Supply current papers of steam and boiler-room practice, for many good ideas are born this way. Make the work profitable, and the more a skillful fireman saves the more let him profit, as this is the only way to encourage skill and care.

Not all boiler-room improvements are those dealing with heat units, thermodynamics and the steam cycle. Many of them are only common-sense, human everyday improvements. But to accomplish anything there must first of all be the desire for betterment on the part of the management. It is the management that must instill into the men the doctrine of efficiency and conscientiousness. It is the management that should set the example of zealousness and economy—and these are contagious. It is the management that should offer increased remuneration as incentive for skilled and painstaking work, and thus place economies obtained upon an equitable basis. But how often is the management really zealous or for more than a passing while? How can the boiler-room force imbibe the spirit of efficiency, when it is lacking amongst those that profit most?

Joseph W. Hays in his book on "How to Build Up Furnace Efficiency" has curtly said: "Where nobody reports to anybody about anything and nobody is made responsible for anything, nothing can be expected because nobody is interested." This state of affairs unfortunately exists in many boiler rooms—and economy suffers. The remedy is, however, one easily accomplished, quickly and cheaply, wherever there is the desire. Elsewhere in this issue appears two articles by Messrs. Lawton and Kentish-Rankin that discuss similar phases of boiler-room operation from different viewpoints, but each having the same goal—economy of performance.

An Electrical Christmas

THE Society for Electrical Development is making a drive for an Electrical Christmas, having for its slogan, "Give Something Electrical This Christmas." Such gifts are more than ordinarily appropriate now in these times of the nation-wide thrift movement, whether in the simple home of the poor man or the rich man's mansion. The electrical gift is permanent, to remain many a day after other gifts have passed away, to remind one of the giver and to serve a useful purpose. It is useful always, and usually ornamental. It is a true friend, and often a friend in need, saving time and effort and money. The electrical gift is a seasonal gift, because it is always in season, and yet the Yuletide season seems especially opportune for this all-year gift. It stays to work and saves muscle and bodily aches, to maintain health, to economize time, to give cheer where most other gifts become unseasonal, grow out of fashion, tire one as their novelty wears off, to eventually pass away into oblivion. But not so with the electrical gift. The more it is used the more indispensable it becomes to matron and maid alike. The electric washing machine, the toaster, the vacuum cleaner, that universal friend of the family, the flat iron, the coffee percolator, the fan and so many more, each and every one so useful, so indispensable to those that know, for where is one who would be without them that once has used them?

Notwithstanding unprecedented industrial activity and national prosperity, this Christmas will not be quite the same as the Christmas of other years. There are too many homes where someone is absent, someone who has answered his country's call to carry the Stars and Stripes to glory in a foreign land, for this Christmas to be as the Christmases of other years. It will not be a Christmas of empty frivolity and carefree jollity, but a Christmas of sober thought, of usefulness and of thrift.

The electrical gift is a thrift gift. Thrift spells the electrical Christmas gift. Let this be a Christmas of electrical gifts for every home. Encourage the electrical Christmas gift idea.

Boost Electrics Now

NEVER were economic conditions so favorable as now for the electric vehicle to serve alike nation and individual. The high cost of gasoline, scarcity of labor, the conservation of fuel, men, time and materials—these the electric vehicle largely solves. Even the season is ours, if we but use it, for horses, ice and mud are our allies in a good cause. This is the era of the electric vehicle. Let us advertise an opportunity so vitally important to nation and individual.

Week's Events

Goodwin Movement Progressing—General Electric May Increase Stock—Radio Men for Signal Corps—Manufacturers Co-operating with Government—Price Control—Other News

GOODWIN MOVEMENT MAKING RAPID PROGRESS.

Co-operative Meeting in Chicago November 27—Additional States Adopt New Constitution.

Manufacturers, jobbers, central stations and contractor-dealers were all represented in an informal dinner-meeting held at the City Club, Chicago, Ill., on November 27, at which William L. Goodwin was the principal speaker. The meeting, which was arranged by Norman J. Pierce, president of the Electrical Contractors' Association of Illinois, was in the way of an educational meeting, designed to acquaint the various branches of the industry with the principles of merchandising advocated by Mr. Goodwin. The annual meeting of the Illinois Association will be held in January, at which time the new constitution as proposed for the various states at the New Orleans convention of the National Electrical Contractors' Association will be presented for adoption.

In his address Mr. Goodwin showed wherein each branch of the industry could benefit by proper co-operation and the adoption of scientific principles of merchandising. The electrical industry is the only one where there are four factors involved—manufacturer, wholesaler, retailer and central station. Mr. Goodwin pointed out that central stations do not fully appreciate the value of the work that can be done by dealers and contractors in creating good will instead of dissatisfaction among the utility's customers. Dealers and contractors are in closer touch with the public than the utility, and the contact is much more personal, but their potential influence has never been capitalized.

The reorganization work of the National Electrical Contractors' Association is progressing very rapidly, ten states now having adopted the new constitution. When 16 states have been secured, a meeting of the new executive committee will be held and the new organization of contractors-dealers will be a fact. Col. Robley S. Stearnes, president, is confident that the meeting will be held early in January.

ENORMOUS GROWTH OF GENERAL ELECTRIC COMPANY REQUIRES STOCK INCREASE.

Estimated Business for 1917 Is $230,000,000, Compared with $169,000,000 for Last Year.

In connection with the published call for a meeting of the stockholders to be held at Schenectady, N. Y., on January 3, 1918, to vote on a proposition to increase the authorized capital stock of the company from $105,000,000 to $125,000,000, the General Electric Company has issued the following statement:

"The proceeds of the $15,000,000 three-year notes issued by the company in July, 1917, and of the $10,000,000 two-year notes which have just been sold, are for temporary use made necessary by the increase in the orders received by the company from $133,000,000 in the year 1915 to $230,000,000 estimated for the year 1917.

"This large increase has required extensions to manufacturing facilities which, from January 1, 1916, to date have amounted to $36,000,000, completed and in process of erection. The increase in inventories and in customers' notes and accounts in the same period aggregates about $70,000,000.

"As normal business conditions are restored, it is expected that sufficient capital will be released by the reduction of inventories and notes and accounts receivable to meet the $25,000,000 notes at their maturity.

	1917 (Partly estimated).	1916.	1915.
Orders received	$230,000,000	$169,582,058	$133,363,891
Sales billed	192,000,000	132,242,290	85,522,070
Net income (after all taxes) applicable to interest and dividends	27,000,000	19,160,973	12,307,995
Surplus at close of fiscal period, after paying interest and dividends	50,000,000	34,361,000	23,693,000

"The $10,000,000 capital stock which it is now proposed to offer to the stockholders at par will supply all the permanent capital which it appears necessary to provide at present.

"The directors have preferred to adopt the policy of paying semiannual stock dividends at the rate of 4 per cent per annum in addition to the regular 8 per cent cash dividends, rather than to increase the rate of dividends or to distribute a larger stock dividend payable at one time. The decision to distribute stock dividends semiannually in addition to the regular cash dividends has been reached in view of the large surplus account of the company, representing earnings invested in additional manufacturing facilities and working capital."

NEED FOR ELECTRICAL MEN IN AVIATION SECTION OF SIGNAL CORPS.

Many Opportunities for Radio Service in Connection with the Flying Corps.

Electrical men are needed for radio work for the Aviation Section of the Signal Corps. Men with previous radio experience are considered desirable candidates for this service, but radio experience is not absolutely necessary and men who have had experience in telegraphy can quickly pick up the essentials and by practice become of equal value. In fact any man who had had electrical experience will be able to grasp the fundamentals quickly and in a short time become proficient in the work required.

A training school has been established for intensive

education of radio operators and mechanicians at Camp Kelly, Texas, and the course of training will last from six to eight weeks under the most capable instructors the Signal Corps can provide.

In addition to the elementary electrical knowledge which is necessary, the course will include the following subjects: Radio power circuits, primary circuits, secondary circuits, condensers, oscillations, radiated currents, ether, received waves, receiving circuits, detectors, wave meters, instruments.

The last part of the course will be devoted to extensive practical work and the operators will be required to take the apparatus out on the field and communicate with airplanes under actual flying conditions. Repair men during the same time will work with the apparatus which is to be used on the planes and will learn how to install, repair and care for this apparatus.

Applicants will be enlisted as privates and will remain as such until they have been assigned to their proper places in a squadron.

If an applicant for enlistment has had a college education or its equivalent, he may consider himself eligible for a nonflying commission in the Aviation Section of the Signal Corps.

Application forms for enlistment in this branch of the service may be obtained from the secretary of the American Institute of Electrical Engineers, 33 West 39th Street, New York City.

WASHING-MACHINE MANUFACTURERS OFFER PLANTS TO GOVERNMENT.

Resolutions Pledging Co-operation Adopted at Chicago Meeting of Association.

The members of the American Washing Machine Manufacturers' Association again pledged their loyal support to the Government at the meeting in Chicago at the Hotel Sherman on November 21 and 22 by unanimously adopting the following resolution:

"The members of the American Washing Machine Manufacturers' Association, representing fourteen-fifteenths of all the capital employed in this country to manufacture washing machines for household use and whose production is valued at over $10,000,000 per annum, in convention assembled, unanimously reiterate their pledge to the President of the United States and our country of their unswerving loyalty and of their willingness to devote the resources of their industrial plants to the use of our Government for war purposes."

Sam T. White of the White Lily Manufacturing Company, Davenport, Ia.; W. L. Rodgers of the Pittsburgh Gage & Supply Company, Pittsburgh, Pa., and Raymond Marsh, secretary, Chicago, were elected members of the Washing Machine Manufacturers' War Service Committee to represent the industry before the War Industries Board. The association is now compiling a list of the equipment in all plants of all washing-machine manufacturers for the purpose of offering the facilities of the members' plants to the Government for war purposes."

The meeting was the largest ever held by the association. Among the speakers and their subjects were: R. D. Hunt, Dexter Company, Fairfield, Ia., on "Standardization"; Willard C. Kitchel, income tax expert, Northern Trust Company, Chicago, on the "War Tax Law"; H. G. Braunlich, H. F. Brammer Manufacturing Company, Davenport, Ia., on "Fire Prevention Work"; H. L. Hay, chemist, Stark Rolling Mill Company, Canton, O., on "Sheet Metal"; Howard Power, White Lily Manufacturing Company, Davenport, Ia., and W. T. Hayne, Conlon Electric Washer Company, Chicago, on "Cost of Production in the Industry, Including Conditions Which Are Changing the Cost of Production."

At the request of manufacturers of washing machines located in Canada, the constitution and by-laws of the association were amended to permit Canadian manufacturers to become members.

The next meeting will be held in Chicago, Hotel Sherman, on January 23 and 24, 1918.

WAR SERVICE APPOINTMENTS OF ELECTRICAL MANUFACTURING INDUSTRY.

Electrical Manufacturers' Organizations Appoint a Joint War Service Commission.

In accordance with a resolution passed at the last meeting of the Electrical Manufacturers' Council, the following appointments have been made on the War Service Commission of the Electrical Manufacturing Industry:

For the Associated Manufacturers of Electrical Supplies—J. R. McKee, General Electric Company, and R. K. Sheppard, Simplex Wire & Cable Company.

For the Manufacturers' Club—C. A. Terry, Westinghouse Electric & Manufacturing Company, and W. W. Nichols, Allis-Chalmers Manufacturing Company.

For the Electric Power Club—C. L. Collens, Reliance Electric & Engineering Company.

ORGANIZATION WAS SECRET OF RAPID CANTONMENT CONSTRUCTION.

Three Papers on Subject Presented Before Meeting of Western Society of Engineers.

The construction of the 16 National Army cantonments and a similar number for the National Guard was discussed in three papers presented at a meeting of the Western Society of Engineers, held on the evening of December 3. The first paper by C. B. Burdick described features of the construction at Camp Grant, near Rockford, Ill. This cantonment is typical of all the others. It comprises a total area of about nine square miles and includes a total of 1520 buildings. Mr. Burdick dwelt especially on the design and installation of the water supply, sewer and road systems, which were put in under his direction as consulting engineer. The water is obtained from six wells by means of air-lift pumps. A group of electrically-driven air compressors furnishes the air necessary. From the well-discharge outlets electric centrifugal pumps pump the water to concrete and steel elevated storage and pressure reservoirs. The water distribution system consists largely of Washington and Oregon wood pipe in place of cast-iron piping, because the former material was more readily available. The piping is laid out almost entirely on the loop plan, so that practically every building can receive its supply from either side of the loop mains, thus minimizing liability to interruptions. Trenches for the sewer system, as well as for the water mains, were dug by means of trenching machines; a total of about 63 miles of trenching was done in this way very rapidly. All of the construction was planned for low first cost and speed in the erection, even though this entailed high maintenance and operating costs. A very large portion of the work was completed in two months after

the original surveys were begun. Mr. Burdick said that three things contributed especially to the rapid construction. These were very complete and detailed and yet elastic instructions from the general quartermaster's department at Washington; second, all contracts were let on the basis of cost plus fair profit; third, all work was carried out under the immediate charge of a construction quartermaster at the camp who had full authority. A number of engineering firms were called on for expert design and supervision of important parts of the work. The quartermaster in charge was not required to advertise for bids, but contracts were let to only responsible firms that could be relied upon for promptness in executing their contracts. The plans were so arranged that they could be quickly changed over night, if necessary, in order to meet special conditions met with in the work.

N. B. Garver, assistant professor at the University of Illinois, described the organization, handling of materials and building erection at Camp Meade. This camp is located almost midway between Baltimore and Washington, and comprises 18 square miles. The camp site is between the tracks of the Pennsylvania and the Baltimore & Ohio Railroads, so that the tracks of an electric railway are used for handling cars from these two steam trunk lines. Prof. Garver described at length the organization effected by the general contractor, which was responsible in a very large measure for the rapidity with which the construction was carried on. In spite of an inferior quality of labor the work was done in practically record time, involving the construction of hundreds of buildings to house a total of some 40,000 soldiers. A simple system of keeping up progress reports enabled close check on the work being done, on the materials delivered and those to be delivered.

A. C. Willard, professor of heating and ventilating, University of Illinois, described the heating, cooking and laundry equipment installed for the various cantonments, with the design of which he was concerned as consulting engineer. He referred to special tests made at the Engineering Experiment Station of the University of Illinois, the results of which showed it necessary to change completely the design of heating first contemplated. On account of the high cost and the difficulty in getting materials in sufficient volume promptly, it was decided to use central steam heating for only a few of the cantonments. In most cases the buildings are heated by means of cast-iron air heaters, placed in the middle of the larger rooms. Special consideration was given to minimizing the fire risk. One of the greatest concerns was for a design of cooking equipment that should be adequate for feeding such large numbers of men. Something over 8000 large ranges were required for the 16 principal camps. The laundries installed were required to be larger than any single laundry ever placed in operation. In a few of the camps the War Department installed its own laundries, but in most of the others the laundry service was leased as a concession to private companies.

IMPORTANT MEETINGS OF ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES.

Special Meeting of All Members Decided on to Discuss War Problems.

A meeting of the Associated Manufacturers of Electrical Supplies was held on December 3 at the offices of the Association, 30 East Forty-second Street, New York City, at which the chairmen of all sections of the association were present to consider matters in connection with the General War Committee of the Electrical Manufacturing Industry, recently appointed by the Electrical Manufacturers' Council. J. R. McKee, of the General Electric Company, and R. K. Sheppard, of the Simplex Wire & Cable Company, are the representatives of this association on the committee and were present at this meeting to formulate plans for the proposed work of the committee.

After a very general discussion it was decided to hold a meeting of all members of the Associated Manufacturers of Electrical Supplies at 10 a. m. on Thursday, December 13, at Delmonico's, Fifth Avenue and Forty-fourth Street, New York City. The General War Committee is in the meantime holding a session at Washington with the government officials.

PROGRESS OF GOVERNMENT PRICE CONTROL.

What Is Being Done in the Matter of Price Control and Distribution and Possibilities of Future Discussed in National Chamber War Bulletin.

In drawing conclusions from the results thus far of what the Government is doing in regard to price control and distribution, a war bulletin issued by the committee of the Chamber of Commerce of the United States co-operating with the Council of National Defense declares there should be a clear understanding of the nature and extent of what has been done.

Control of prices by the Government, it is explained, may be for the following purposes:

(1) To enable the Government or the public, or both, to purchase at prices below those established by market conditions.

(2) To substitute for the ordinary method of distribution by price a method of distribution of product on a basis of the country's requirements in connection with the prosecution of the war.

(3) To prevent the making of large profits out of the war and thereby, among other things, eliminate a cause of great discontent on the part of labor.

Where Government Has Fixed Prices.

Our Government, the bulletin goes on, has fixed prices on copper, steel, coal, coke and pig-iron. In these cases, the prices to the public and to the Allies have been the same as that to our Government, and the prices have been substantially below those prevailing in the market at the time. Therefore, the control of these prices by the Government has accomplished the first of the three purposes indicated above.

There has not, however, been established thus far in any case a method of distribution in connection with the control of prices, it is said. Priority on specific orders has been granted, but no general effort has been made to distribute production among those whose requirements are most urgent considered from the standpoint of national defense. In fact, the activity of the Priority Committee of the War Industries Board has thus far been confined almost entirely to the granting of priority on Government orders. No general rules of distribution have been laid down. No announcement has been made of a classification of essential and non-essential industries. Priority decisions are still made on the merit of the particular application and not on the thorough-going consideration of the general requirements of industry.

CONSIDERATIONS IN GOVERNMENT PRICE FIXING.

"This makes it quite evident that up to the present time, the Government has not attempted to accomplish purpose number two of the classification mentioned above," the bulletin says. "In the next place wherever prices have been fixed by the Government consideration has been given to the necessity of stimulating production and prices have been established at a sufficiently high level to accomplish this purpose. This has, of course, produced high prices and has in a large number of cases resulted in large profits—far beyond those earned in normal times. The fixing of prices has not been accompanied by an arrangement under which excess earnings are paid into the public treasury—some such arrangement as that which has been adopted in England, in connection with the 'controlled' plants."

"Therefore, as large profits are being made even in industries where the Government has fixed prices, the Government is not yet able to enter upon the accomplishment of the third of the purposes above set forth."

WHERE THE GOVERNMENT GOES SLOW.

It is not unnatural that the Government should proceed slowly and hesitatingly with such unprecedented action as the control of prices and distribution, the bulletin continues. The very magnitude of the undertaking restrains the vigor and energy which would characterize the effort to solve a less difficult problem. In any event, however, success is only relative and in the early stages may be lost sight of entirely because of unavoidable confusion.

"This makes it all the more important to distinguish between the results of partial effort which does not even endeavor to secure full results and those of thoroughgoing, well developed effort," the bulletin goes on. "When the Government has not endeavored to establish a new method of distribution to take the place of distribution by price even in the instances where the Government has controlled prices and where no effort is made to prevent the earning of large profits where prices have been fixed, it is not to be expected that production will be distributed on the best basis for the national defense or that discontent on the part of labor will be avoided.

GENERAL BASIS FOR PRICES.

"There has not been developed as yet a clear policy with regard to securing the assistance of business men in connection with the control of prices. In some cases the Government has called upon those interested in a business to participate in the actual fixing of the prices. This has resulted in a fixing of prices by negotiation—which is clearly harmful. In the judgment of the committee, men selected by an industry to represent it should be called upon by the the Government for full information which would be helpful in fixing prices, but the actual determination of the price should be a semi-judicial function."

IMPORTANT POWER CONTRACTS MADE BY INTERBOROUGH COMPANY.

Will Furnish Power to Subsidiaries of Brooklyn Rapid Transit Company.

The Interborough Rapid Transit Company, of New York City, is supplying the power for the operation of the Broadway subway, and, under a contract approved by the Public Service Commission, it will continue to furnish it when the line is completed. It will also furnish the power needed for the operation of all of the rapid-transit lines in Manhattan Borough controlled by the New York Consolidated Railroad Company and the New York Municipal Railway Corporation, two of the subsidiaries of the Brooklyn Rapid Transit Company.

The Interborough company's power plants, when all are completed, will possess capacity far in excess of immediate demands. The agreement is to run for ten years, beginning December 1, 1917, and the company contracts to furnish, during this period, all of the power which the Brooklyn companies may need for the propulsion of trains, and the operation of signals, lights, etc., upon the lines numerated, which include the Broadway subway, the Canal Street subway, the Nassau Street subway, the Centre Street loop, the Fifty-ninth and Sixtieth Street subway, and the Fourteenth Street-Eastern line. With the exception of the Sixtieth Street tunnel the power service under the contract will cease in the middle of the East River. In the case of the exception the power will continue until connection is made with the lines in Queens.

It is estimated that the annual demands of the Brooklyn company from the Interborough company for the first year under the agreement will be about 49,900,000 kilowatt-hours of direct-current energy at 625 volts for traction purposes. At the end of the ten-year period the estimated requirements will be 118,800,000 kilowatt-hours. This increase indicates the expected increase in the traffic business of the Brooklyn companies in this borough.

Part of the agreement provides that the Interborough company shall furnish alternating-current energy at 11,000 volts for signals and lighting. Estimated requirements for this current for the first year are 4,235,000 kilowatt-hours and for the tenth year 6,902,000 kilowatt-hours.

Active Membership Campaign for New York Electrical Society.

A well directed and organized drive that is expected to result in the addition of five hundred new members to the New York Electrical Society has been started by its Membership Committee, whose chairman is Walter Neumuller of the New York Edison Company. Already 61 members have been obtained and the number is expected to grow rapidly as the campaign gathers momentum.

An able staff of trained and experienced men is planning and conducting the drive. Mr. Neumuller has associated with him such capable and desirable advisers as W. S. McClure and S. D. Ward, of the New York Edison Company, and H. A. Currie, W. J. Moore, W. D. Protosky and C. E. Stephens, all connected with New York companies. Conferences are held frequently at which the committee discusses the methods to be employed.

To create a lively interest in the campaign all of the members of the society have been asked to cooperate. Everybody in, or associated with, any branch of the electrical industry in and near New York City will be approached and made to appreciate the advantages of being connected with the society.

To keep in touch with progress made, a chart has been prepared showing the number of new members anticipated each week. Alongside of these weekly figures are placed the number actually gained. Reference to the chart at the present time reveals surprising success. By June 1, 1918, the 500-mark is expected to be reached.

The New York Electrical Society is the oldest electrical organization in existence in that city. It is a medium between the extremely technical societies and the more or less commercial associations. It welcomes all in the electrical field.

Illuminating Engineers Arrange for Several Active Meetings.

The Pittsburgh Section of the Illuminating Engineering Society is going to Cleveland, Ohio, to hold a meeting on December 14. There will be a morning and an afternoon session conducted by the Pittsburgh Section alone. The several papers, which have not been announced as yet, will deal principally with the illumination of office buildings, to interest architects in particular. E. J. Edwards, of the Westinghouse Electric & Manufacturing Company, is arranging the program. In the evening a joint session will be held with the Cleveland Section, at which illumination in the war district will be the general subject. These meetings will be held in the Electric League rooms.

On December 13 an interesting meeting will be held by the New York Section at the Edison Film Company's studio. A paper will be presented upon the subject of the incandescent lamp in motion-picture projection. The authors of this paper are J. A. Orange, of the Research Laboratories of the General Electric Company, Schenectady, N. Y.; L. C. Porter, of the Edison Lamp Works, Harrison, N. J.; A. R. Demington, Westinghouse Lamp Company, New York, and J. T. Caldwell, National Lamp Works, Nela Park, Cleveland, Ohio. Dinner will be served and those attending will be asked to take part in the production of a motion picture of a Japanese tea garden scene.

At the meeting of the Chicago Section, on December 13, Arthur H. Ford, head of the Electrical Engineering Department of the State University of Iowa, will present a paper upon the subject, "Automobile Headlight Lamp Filaments and Measurements."

Utility Companies Conserving Fuel.

The Louisville Gas & Electric Company and the Public Service utilities on the north side of the Ohio River, are co-operating in every way possible in accordance with the recommendations of the Fuel Administration for conservation of coal by curtailing electric signs. The companies are pulling switches on their own signs according to the hours prescribed and the Federal Sign System (Electric), is doing the same thing, while the individual owners of signs are being depended on to control the length of time their signs are in operation. The Seelbach Hotel of Louisville, has gone further and extinguished its roof sign altogether. Saving of coal by this means will be negligible, however. Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, is quoted as stating that the result might be to reduce consumption of coal perhaps one ton a day.

Texas Interurban Railways Taken Over by State Commission.

As the result of the recent action of the interurban railway companies of Texas in advancing their freight and express rates, the Texas Railroad Commission has issued an order assuming jurisdiction over all these roads. The Railroad Commission will make a thorough investigation of the interurban lines with a view of determining what rates on freight and express shall be applied. It is required in the order that the interurban railway companies immediately file with the Commission all passenger, freight and express tariffs covering a period from October 1, 1917, to the present time. The action of the Railroad Commission in extending this jurisdiction to interurban lines came entirely unexpected to the interests involved although under the law it is given the same authority over these properties as it is given over the steam railroads.

Institute Meeting in New York, December 14.

The 335th meeting of American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York City, December 14, at 8:15 p. m. Two papers will be presented at this meeting: "Magnetic Flux Distribution in Annular Steel Laminae," by A. E. Kennelly and P. E. Alger, of the Massachusetts Institute of Technology, and "Phenomena Accompanying Transmission with Some Types of Star Transformer Connections—II," by L. N. Robinson, of Leland Stanford, Jr., University. The latter paper is an amplification of Mr. Robinson's former paper presented at the Panama-Pacific convention and published in the A. I. E. E., Transactions, 1915, page 2183. All who are interested in these subjects are cordially invited to attend and take part in the meeting.

Electrical Review's Street-Lighting Schedules Are Ready.

In accordance with its long established annual custom, the ELECTRICAL REVIEW has had prepared street-lighting schedules on the all-night and moonlight systems covering the entire year 1918. The tables for each month will be published in these columns in next to the last issue of the preceding month.

For the benefit of those readers who find it more convenient to keep the tables for the whole year together, they have been published in booklet form, the schedules proper being printed on a single sheet that may, if desired, be detached from the booklet and mounted as a wall calendar. This booklet, which is more complete than any that have preceded it, contains the rules on which the schedules are based, instruction on the corrections for standard time and latitude, explanation on how the tables may be used for modifications or combinations of the schedules given, and an exceptionally complete table of monthly and yearly totals for five schedules. These are the two schedules given in detail and also three others readily derived therefrom. Rules are also given for easily finding monthly and yearly totals for other modifications of the schedules. The effect of the proposed "daylight saving" on street lighting is also explained. This booklet is obtainable at 25 cents a copy.

A few readers have requested us to furnish complete tables of the actual number of hours and minutes of lighting on each night of the year. Such tables can be furnished at the actual cost of copying them; they give the actual time of burning each night on any of the five schedules whose totals are given in the booklet. Detailed tables of corrections for standard time and for latitude for the all-night schedule can also be furnished for any place in the United States or Canada at the actual cost of preparing them.

NEWS NOTES

New Officers of New York Associated Electrical Contractors.—At a recent annual meeting of the Associated Electrical Contractors, Inc., of New York, the following officers were elected: President, H. M. Walter; vice-president, B. W. Sandbach; treasurer, J. W. Flint; secretary, H. S. Beidleman, and sergeant-at-arms, B. J. Anderson.

Increased Water Power Saves Much Fuel Oil.—By raising the dams at Huntington Lake 31 feet, the storage capacity of this reservoir for controlled waters flowing through Big Creek power plants Nos. 1 and 2 of the Southern California Edison Company has been materially increased. This work has cost about $2,000,000 and will result in the saving of about 600,000 barrels of fuel oil this year.

Grand Rapids to Replace Arc Lights.—City of Grand Rapids, Mich., has decided to supplant its arc lights for streets with nitrogen incandescent lamps of 400 to 600 watts. The change involves the installation of seven 70-kilowatt constant-current transformers and 1500 lamps. The light, water and other municipal service is under direction of L. D. Cutcheon, Public Service Director.

Alex Dow to Talk on Capital for Utilities.—Alex Dow, president and general manager of the Detroit Edison Company, will make an address on "Capital for Public Utilities—Its Nature and Its Cost," before a meeting of the Detroit-Ann Arbor Section of the American Institute of Electrical Engineers to be held in the Board of Commerce Building, Detroit, Mich., on December 14. Managers of public utilities and electrical engineers and others interested in the subject are invited to attend this important meeting.

American Institute Members Show Loyalty.—Secretary F. L. Hutchinson has sent out a personal classification sheet to the entire membership of the Institute, 8600 all told. The information concerning the individual qualifications of the members who fill in and return the blanks will be indexed and made available to the Government. To date, 1730 replies have been received, and as the sheet was mailed out about the first of November, returns are still coming in. A war service card was also sent out to ascertain how many of the members were actually in the service—that is, men who wear the uniform. Returns so far show that there are 500 in this class. In the December issue of the Proceedings, an honor roll will be published.

Empire State Gas and Electric Association Suspends Meetings.—At the meeting of the Executive Committee of Empire State Gas and Electric Association held November 16, 1917, it was decided that during the continuation of the war, meetings of the different sections should be discontinued. As this policy took effect at once, arrangements for the meeting of the electric meter section called for November 23 in Albany was cancelled. The Executive Committee believes that these meetings of the different sections have been of great value and decided on their temporary discontinuance only on grounds of economy and on account of the shortage of men and the consequent difficulty of allowing any of the men to be away. The Executive Committee announced that it would be glad at any time to have representatives of the member companies attend its meetings, which are held on the first Friday after the sixteenth of each month.

St. Louis Jovians Hear Talk on Trench Warfare.—St. Louis Jovians listened to a graphic description of fighting on the western front in France at a luncheon meeting November 27, when Lieut. J. D. Cameron, of the British-Canadian Recruiting Mission, who has spent one year in the trenches and as the result of wound one year in the hospital, was the speaker. Lieut. Cameron took as his subject, "Trench Warfare" and outlined in detail the difficulties to be met in attempting to cross "No Man's Land," and the daring and skill required to successfully carry out a raid on the enemy's trenches. His address was enthusiastically received by one of the best attendances of the season. The luncheon room was artistically decorated with flags and bunting for the occasion.

Uniform Accounting System for Electric Utilities Proposed by Pennsylvania Commission.—The Public Service Commission of Pennsylvania has devised a tentative draft of a uniform accounting system to apply to all electric companies operating in the state. The system is the result of a careful study of accounting classifications as prescribed by the utility commissions of other states, incorporating the views of the Pennsylvania Electric Association and experts associated with the Commission. The draft has been forwarded to the various electric companies for consideration, with privilege to submit criticisms and suggestions prior to a formal hearing for final action. The details of the new accounting system are being handled by C. I. Joyce, chief of the Bureau of Accounts and Statistics.

Government Needs Trained Electrical Men.—Electrical men are wanted for early service overseas. The men in the front line trench need the help and co-operation of skilled men back of the lines, and electricians, engineers and others are wanted at once for the Enlisted Ordnance Corps, National Army. Uncle Sam is calling on our industry to come across and help his fighting men. There is a lot of work to be done over there, and the call has gone out for electrical men between the ages of 18 and 40 who want to do their bit and who know their job. Modern war is a tremendous business, and the army that wins is the army which has the best equipment and the best men. The men are over there now—they are ready to go ahead, but they still need experts in our line to repair and maintain their equipment. Information can be obtained by applying to the Chief of Ordnance, War Department, Washington, D. C.

Electric Sign Curtailment Produces No Important Effect in Philadelphia.—As a result of the order of the Fuel Administration curtailing the lighting of electric signs, the Philadelphia Electric Company is saving on an average of about 8 tons of coal daily, or approximately at the rate of 2500 tons a year. The company holds that the effect is "psychological rather than practical," estimating that the saving of fuel is less than one-third of one per cent of its total of 600,000 tons of coal used annually. The company's figures show that the number of burning hours for illuminated signs in the city under normal conditions is about four, with the present curtailment order reducing this to three hours. The electric sign business represents less than one-fifth of one per cent of the total power operations of the company. The important factor of the recent order is said to be the omission of the electric signs during the peak hours.

Commercial

Advance Payments Asked for Extensions—Explaining High Bills—Dust Precipitator Proves Useful—Accident Prevention in Denver

BINGHAMTON CENTRAL STATION REQUIRES ADVANCE PAYMENT FOR EXTENSIONS OR CONNECTIONS.

Necessity of Conserving Capital as Well as Coal Brings Adoption of New Rule.

The Binghamton Light, Heat & Power Company, of Binghamton, N. Y., has made the following important announcement to all its patrons:

"This company, recognizing that every effort must be made by man, woman and child to win the war, is endeavoring in its operations to conserve coal, labor and supplies, so as to aid in every possible way the authorities at Washington. The recent order of the Fuel Administration in the discontinuing of sign lighting for certain periods in order to save coal at the power plants is a small part of this program and is a forerunner of further economies to be ordered by the authorities.

"Beyond these savings, however, there is the urgent necessity of saving capital, if we are to give the Government the financial support it requires to provide for the large sums of money necessary to carry on the war. Extensions to the system of a public utility company, whether in distributing or power plant, require capital, which, in times such as these, should be used only for war purposes. This company has nearing completion a large modern power plant, which is affecting a material saving in coal over the present inefficient generating station. This will be completed, as it aids materially the conservation plan, and as all arrangements were made prior to the war and the construction is nearing an end.

"No further electrical extensions or connections will be made unless the parties to be served advance to the company the cost of such extensions or connections, and then only provided assurance is given satisfactory to the company, that the money loaned for the purpose cannot be better used in some other way to meet the nation's war requirements. Where the light or power is required by manufacturers for war contracts, in special cases exceptions to the above rule may be made upon proper evidence from Washington that such contracts are for war necessities.

"This policy, we realize, works a hardship on the company and the public, but so does war work a hardship on the lives of the soldiers at the front. Further information can be obtained at the office of the company."

This policy is being adopted by all subsidiary companies of the Eastern Power & Light Company and General Gas & Electric Company.

Puget Sound Company Permitted to Increase Rates.

Washington Public Service Commission has granted the Puget Sound Traction, Light & Power Company permission to advance rates to new users of electric power for other than lighting purposes. The minimum rate for 100 horsepower under the new schedule is increased from 0.5 cent to 1 cent per kilowatt-hour and the minimum rate for from 21 horsepower to 100 horsepower is changed from 0.9 cent to 1⅛ cents. The Commission approved the cancellation of a special rate that had been in effect for some time, providing for a reduction of 33⅓ per cent on all off-peak loads. Other special rates that had been in effect were also cancelled by order of the Commission.

Educating the Customer to Consider Reason for High Bills in Winter.

A bit of good-will advertising of special interest in connection with the increased proneness of the average consumer to kick about his electric light bill at a time when his other bills are soaring under the influence of present prices, is being done by the Paducah (Ky.) Light & Power Company. The advertisement bears the caption, "We must both be satisfied," and displays a cut of Father Time with a dial at each side, showing an average of nine hours of darkness out of the 24 in summer, and over 16 hours of darkness in the 24 in winter. The argument reads: "In June the average use of electric light in residences is only 2.55 hours per day. We have to accept this as a condition over which we have no control. We must be satisfied to receive from our consumers all through the Spring and Summer months' payments for electric light that are very small.

"In November, December and January the average use of electric light in residences is nearly seven hours per day, or nearly three times as much as in June. This is also due to a condition over which neither you nor we can exercise any restraint. Your bills for electric light are consequently larger. We merely ask you not to be unduly hasty in criticizing us for the higher lighting bills, but to consider the above chart and the facts herein stated."

Electricity Used for Protecting Land From Injury.

W. L. Miller, manager of the Interstate Light & Power Company, Galena, Ill., calls attention to one of the new uses for electricity. The National Separator Company at Cuba City, Wis., has installed a Cottrell electric dust-precipitator on its smokestacks so that obnoxious particles in the smoke and fumes will not settle on the land in the vicinity of the zinc-ore-roasting plant. Incidentally the dust thus saved is of value.

Mr. Miller says: "The general scheme used for this purpose is to raise the voltage to about 100,000 volts and then rectify it and charge the equipment in the stack, which in turn charges the dust particles and causes them to precipitate in the bottom of the stack. This is not an entirely new idea. It is being practically applied at other plants for similar purposes. It

is also the basis for certain processes for the elimination of smoke."

The Interstate Company will supply about 25 horsepower for the installation described in the plant of the National Separator Company.

DENVER CENTRAL STATION STARTS ACCIDENT-PREVENTION SCHEME.

Men Urged to Prevent Injuries and Illness so Plants May Work at Full War-Time Efficiency.

An accident-prevention scheme in the nature of a competition has recently been instituted by the Denver Gas & Electric Light Company in the hope of reducing the number of accidents at its plants and thus keeping the Denver organization working at full war-time efficiency. The action taken by the company is one of the first results of a circular letter recently sent to all the Doherty utility properties by R. G. Griswold, chief technologist of the Doherty Organization, urging them to take every measure to prevent illness and injury at this time when every bit of labor is essential to efficient operation.

In bringing this matter to the attention of the property managers, Mr. Griswold said, in part: "We earnestly urge that you and your organization take particular care of your health. Our organization has found it necessary to put part of its reserves in the front line trenches. This means additional work for us today. Our reserves must consist of the overload capacity of the individuals. In order to have this overload capacity available, we must take care that each one of us is in first-class condition. Some of the means that suggest themselves are:

"Keep close watch on your weight. Take particular care not to catch cold, etc. Take early and wholehearted steps to stamp out any disease before it becomes chronic or develops into something worse. Don't run any chances. If you have a weakness toward any particular form of sickness, take double or treble precautions in that direction. A periodical medical examination is not a bad investment.

"Always remember that something may happen to some member of your organization, or that some unusual demand may be made upon it which you will have to take up among the remaining members. To do this requires a little reserve capacity in each individual. We realize that sometimes we must all work day and night, but the most and best work is accomplished in the long run by a regular amount of sleep and a little play, even if the work has to be done in the remaining time by the most intense application."

The Denver company has prefaced its announcement of the accident-prevention program with these words: "You men who are producing heat, light and power for Denver and for the Denver industries making war supplies, are performing a necessary service for your country. Every day that you are absent from work means loss for you, for the company, and for the United States.

Thirteen departments are included in the accident-prevention competition. Each department has a handicap so as to correct for more favorable conditions in other lines of work, thus all departments are placed upon an equal footing in the contest. The contest began on November 8 and will continue until May 1, 1918. On that date, the department standing first, by having the fewest number of accidents, will receive a silver trophy cup from W. J. Barker, general manager of the company. The cup will be awarded every six months, and the department winning the trophy three times in succession will keep the cup. A cash prize of $100 will be given every six months to the foreman of the winning department.

One of the novelties of the contest is that the score of the respective departments will not be based upon the number of accidents, but upon the loss of time resulting from the accidents.

Newspaper Advertising That Pays.

Everybody reads the "funny page" in the daily newspaper, whether on the street car, in the restaurant or at home. By inserting cartoons like the one shown on the funny page, everyone sees it—and enjoys it.

I'M AFRAID I SHOULD HAVE GONE TO THE OFFICE TODAY
I WON'T BE DOWN THIS WEEK. I'VE BEEN IN AN AUTOMOBILE WRECK
IF THIS THE COMMONWEALTH EDISON CO.? OH! SEND ME A FEDERAL WASHER.
THE LAUNDRESS FAILS TO SHOW UP - SO YOU DECIDE TO HELP OUT
THE NEXT MORNING YOU CALL THE OFFICE AND MAKE EXCUSES -
AND TH ATTEND TO ANOTHER LITTLE MATTER, YOU'VE BEEN NEGLECTING FOR A LONG TIME

(Drawing by Orr, Cartoonist on Chicago Tribune)

THERE is no more need of bending over a washtub today than there is of using a tallow dip for lighting. An Electric Washing Machine will do a large family washing quickly.
$5
Puts a FEDERAL ELECTRIC WASHING MACHINE, complete with electric wringer, into your home, and cheer into the minds of matron and maid. Balance in small monthly payments. Saves its cost the first year.
Phone Randolph 1280, Local 214, 215 or 216, for particulars of our Washing Machine Campaign, now in full swing. Or, representative will call upon request, at your convenience.
FREE!
Electric Washing Machines demonstrated and on sale at our Electric Shops and Branch Stores
Commonwealth Edison Company
Edison Building — 72 West Adams Street
CLIP THIS OUT
GOOD FOR $5

Commonwealth Edison Advertisement That Brought Results.

The readers come upon the ad in fitting mood, read it, and "see the point" before they realize the cleverness of the strategy, the camaflouge—and the truth.

This is one of a series of advertisements of the Commonwealth Edison Company, Chicago, which is making a washing-machine campaign such a success.

Power Business at Louisville Increasing.

Applications for power contracts are becoming increasingly numerous with the Louisville Gas & Electric Company. With coal scarce and high and new machinery difficult to get, electricity furnishes the best means of increasing capacity of factories which are on rush order work. Recent contracts signed have included 50 horsepower for the Dow Wire & Iron Works; 35 horsepower for the Goodwin Preserving Company; 75 horsepower for the Aetna Refining Company; 40 horsepower for the Standard Oil Company of Kentucky; 125 horsepower for the Axton-Fisher Company, tobacco manufacturing; and 380 horsepower for Gamble Brothers, lumber manufacturers.

Operating

Using Kerosene for Boiler Treatment—Liberal Use of Oil Saves Starting Troubles—Electric Trucks Solve Transportation Difficulties

TREATING BOILER SCALE WITH KEROSENE.

Should be Used as a Last Resort—Many Precautions to be Observed.

By Lionel Linnell.

Advice regarding the use of kerosene might be almost entirely confined to discussing the dangers and methods of combating them. Unless used carefully kerosene may result in accident, because when heated or sprayed it forms a vapor that is readily ignited in the presence of a naked flame, and moreover human beings may be asphyxiated by these fumes. Realizing the danger and the exercise of care largely overcomes them.

Kerosene is different from graphite in boiler-scale treatment in that the latter is used with the boiler in service and the scale wet, whereas kerosene is usually used after the boiler is taken out of service and after the heat from the settings has dried up the scale. The best results are obtained with kerosene with dry scale for it then works in between the scale and the boiler surfaces, breaking up the former and separating them from the latter. It is thus seen that graphite is really a method of treating boiler surfaces and scale while the boiler is in service, kerosene a method of treating scale after the boiler has been taken out of service.

There are those who advocate feeding kerosene drop by drop in with the feed-water, in the same way that graphite is used for scale treatment. The exponents of this practise claim the kerosene changes the form of the scale, making it more granular in form, and more easily removed from the boiler therefore. Kerosene has, however, no chemical action upon boiler scale.

Using Kerosene During Scale Removal.

After a boiler has been shut down, the water drained off and the surfaces are still a little warm so as to dry up the scale, kerosene may be sprayed in so as to cover every part of the boiler in sufficient quantity to enable it to soak in behind wherever scale is lodged. The boiler should then be allowed to stand while the kerosene works in between the interstices and cracks and under the bottom of the scale. When the kerosene has penetrated properly hammering gently on the boiler or tubes with a hammer will cause the scale to fall and break up in chunks with comparative ease whereas without the use of kerosene continued hammering and the use of scale-removing tools must be resorted to. All scale may not come off by hammering, but some particularly hard stony patches may require chipping, but in any case the use of kerosene helps very materially and shortens the time the boiler must be down for scale removal. The ability to remove the scale comparatively easily with less hammering and chipping is however perhaps of even more importance since the less vibration to which the tubes are subjected reduces the liability of weakening them from this cause, and lessens therefore the chance of ruptured tubes, etc. In any case it is never a good policy to use the hammer on one spot longer than necessary, and if a few blows do not accomplish results go back to it later after the kerosene has had time to work.

When the scale has all been hammered loose the boiler should be thoroughly and vigorously washed out with water under good pressure so that any scale that may happen to still adhere in small quantities here and there may be removed and washed down otherwise it will fall down upon the heating surfaces at a later date and probably cause local overheating and bulging or "bags." As pointed out when discussing the use of graphite for scale treatment, a boiler that has been treated with kerosene should be opened much earlier than one not so treated, because there is always a certain amount of scale that comes down after the boiler starts steaming again, being forced down by the vibration, movement of the metal surface and the ebullition of the water presumably. If not removed this precipitated scale will cause damage.

Precautions in Using Kerosene.

Kerosene vapor should never be sprayed into a hot boiler, for when mixed with the proper proportion of air it forms an explosive mixture. Every precaution should be exercised to prevent its ignition otherwise damage to persons and property are liable to follow. No naked flame should be taken in or around a boiler that is being or has been treated with kerosene until the inside has been thoroughly washed out with water spray and ample time has elapsed for effective ventilation. Only an electric lamp, well protected against breakage should be used during the use of kerosene. There is always possibility of persons entering the boiler being overcome with kerosene vapor unless the boiler is amply ventilated before they enter. Moreover some of the vapor may remain even after the unit has been in service, hence it is always a wise measure to ventilate it well when next taken out of service.

Kerosene is preferable to crude oil in treating scale after a boiler has been shut down. It is however a practice that should be followed only by men able to appreciate the dangers and the precautions necessary to prevent them. At this time every means is desirable for economizing coal by maintaining the inside and outside boiler heating surfaces efficient for heat transmission, and kerosene may be useful for doing this. The writer believes it should be used only as a last resort and after graphite has failed in its purpose, which it is unlikely to do. In any case with changing labor conditions, with new men on the job, and possibly working for long hours, the use of kerosene should be employed only under capable supervision.

Heavy-Machinery Starting Precautions.

By M. S. Montgomery.

With the increasing size of electrical machinery, the increase in weight of the rotating element and the use of anti-friction bearing metal it is becoming of greater importance to safeguard the bearings during the time of starting. Unless a film of oil exists between the shaft and the bearing, damage may be done to the bearing lining under the cutting action that occurs the instant the revolving element starts to turn. Further, if the rings are not gotten into operation almost immediately, damage may occur. The static friction is always the highest value of friction encountered, hence it is obvious that if this is reduced the heavy current rush at time of starting will also tend to be lower.

One company operating a number of 3000 and 4000-kilowatt synchronous converters has made it a practice, originated because of the comparatively frequent bearing troubles and severe starting conditions, to pour about one quart of light lubricating oil into each bearing before starting up the machine. Doing this covers the shaft with oil, which is drawn in between shaft and bearing immediately the shaft turns round, while some of the oil also filters through between shaft and bearing before the element starts to turn. Doing this has been found to eliminate a frequent source of trouble, delay and expense, it has reduced the starting current, lessened the time required for the rotating element to come up to full speed, and no longer allows the oil rings to stick.

In another instance where a very heavy rotating element had to be started quickly and infrequently, this latter tended to allow the oil to be given out of between shaft and bearing under the weight of the rotor, a small motor-driven compressor set was installed. This set was piped so as to enable the lubricating oil to be driven under pressure under the shaft at the two bearings. The shaft was in this way almost lifted up and lay upon a film of oil. As soon as the rotor was turning over the compressor starting oil set was shut down. While the control of this oil-starting set was manually controlled, it would be a very simple, and perhaps a better practice, to make it automatic and dependent upon the starting control apparatus.

Operating Characteristics of Rolling-Mill Motors.

Central-station engineers, electricians in iron and steel mills and others having to do with the operation and maintenance of rolling-mill motors find the question of motor ratings an important one due to the severe overloads and mechanical vibrations which these motors are subjected to. In discussing a paper on electric power in steel plants presented recently by S. S. Wales, of the Carnegie Steel Company, K. A. Pauly of the General Electric Company brought out the following interesting points:

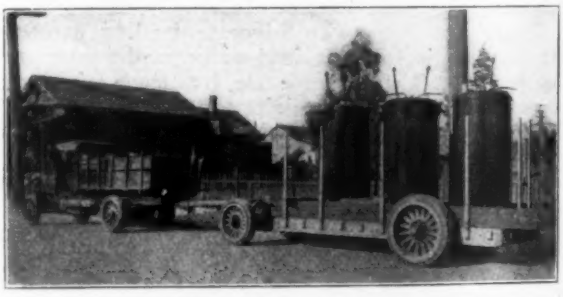
Compounding the roll motor, as agreed to by Mr. Wales, in no way relieves the mill or motor of the mechanical shocks. When the ingot hits the rolls, the roll motors slow down until the combined work delivered by the motor armatures in slowing down and the torque developed by these motors is sufficient to carry the steel through the rolls. The stored energy in the armature acts instantly and delivers the initial blow, whether the motor is shunt or compound wound.

Compounding reduces the overloads on the electrical equipment, but does so at the expense of production as it slows down the rolls while the piece is being rolled. We must appreciate that rolling-mill conditions are extremely severe, and if the equipment is designed to withstand overloads and mechanical vibrations incident to rolling, there will be no need for compounding the roll motors.

Rolling-mill motors should be rated by their continuous capacities, which is a measure of their ability to produce tonnage, and by their maximum overload capacity, which is a measure of their ability to withstand the high momentary overloads of the individual passes. No rolling-mill equipment is properly defined without the specifications of these capacities. Altogether too much emphasis has been placed on the maximum capacity, and any such rating for these motors which includes only the maximum horsepower without a time or speed qualification is not only contrary to the recommendations of the American Institute of Electrical Engineers but extremely misleading and flexible, and no purchaser is safe in assuming that specifying the maximum horsepower at any given speed, or series of speeds, alone protects him against obtaining an equipment inadequate to meet his requirements.

Motor Trucks Overcome Transportation Difficulties

The congestion of railroad transportation facilities has in many cases imposed serious hardships on utility companies, first in affecting the receipt of coal, and, secondly, in the hauling of heavy materials and equipment used in needed extensions. These conditions have resulted in emphasizing the value of the motor truck and many central-station companies are finding their employment an important factor in relieving conditions that are rapidly becoming more and more serious.



Motor Truck Hauling 22-Ton Load Over Mountains.

Utility companies in the mountain and western states have long appreciated the value of the motor truck. There have been many important generating and substations constructed at sites far removed from railroads, and motor trucks were depended upon entirely for all haulage. The accompanying illustration is a typical view and shows the service trucks are called upon to perform. In this instance the truck, which is one of the fleet operated by the Southern California Edison Company, is hauling a trailer over a mountainous road. The three transformers weigh 22 tons.

Central stations east of the Rockies can learn much from the experiences of western companies. The consideration of the motor truck during these times is a patriotic duty as well as one of immediate economic importance.

Construction

Polarized Wiring Required After January 1, 1919—Design for Laboratory Panel—Simple Transfer Gauge—Contractors' Doings

NEW CODE RULE WILL REQUIRE POLARIZED WIRING.

Neutral of Three-Wire Circuits and One Wire of Two-Wire Circuits to Have Identifying Covering.

At the recent meeting of the Electrical Committee of the National Fire Protection Association for revision for the next edition of the National Electrical Code, it was voted to change Rule 26*a* as follows:

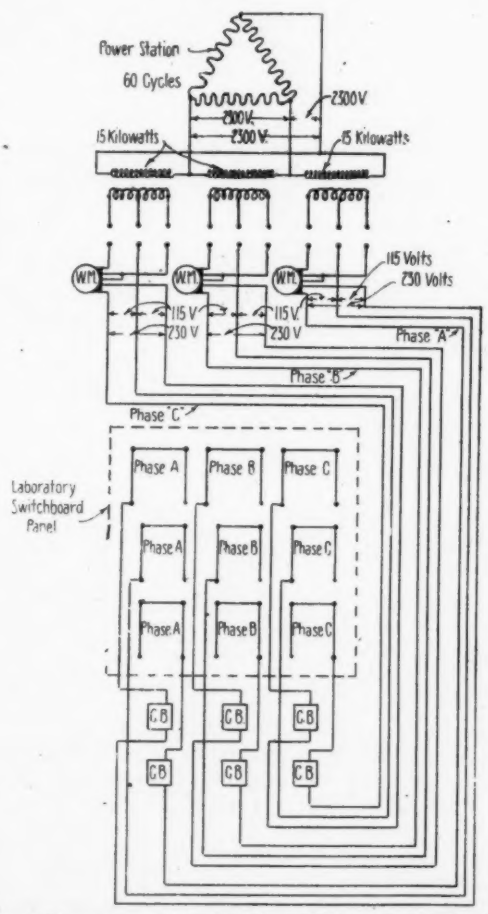
"The neutral conductor of all three-wire circuits and one conductor on all two-wire circuits must have an identifying insulating covering readily distinguishing it from other wires. This wire must be run without transposition throughout the entire installation and properly connected at all fittings to properly identified terminals in order to preserve its continuity. When one of the circuit wires is to be grounded, the ground connection must be made to this identified wire and as prescribed in Rule 15 and 15*A*."

This rule will appear in the new edition of the Code, to be known as the 1918 edition, and does not become effective until January 1, 1919. All fittings having wire terminals, such as sockets, receptacles, cut-out bases, attachment plugs, etc., must have some identifying mark to enable them to be easily connected with the proper terminal. Therefore, the organization known as the Associated Manufacturers of Electrical Supplies has submitted the matter to members of all of its sections covering the devices affected, asking that proper committees be appointed to consider the matter and report results at as early a date as possible, in order that they may be fully prepared for the new order of rules when in effect January 1, 1919.

Simple Design of Three-Phase Plug Board for Laboratories.

No modern college, academy or even high school is complete without a group of laboratories in which the students can experimentally verify and apply the teachings of the classroom. For students taking up electrical engineering in technical schools, as well as for some advanced students in physics in high schools or colleges, numerous experiments require convenient sources of both single-phase and polyphase alternating currents. A simple board to which the students may connect their test circuits is obviously required. The wiring of such a board designed by F. W. Springer, professor of electrical engineering at the University of Minnesota, was illustrated in a recent issue of the Bulletin of the Society for the Promotion of Engineering Education. This particular board derives its power through three delta-connected step-down transformers, each of 15 kilowatts capacity, fed from the 2300-volt, 60-cycle distribution lines running from the power station. The secondary circuits from the transformers are carried as three independent, three-wire, 115-230-volt, single-phase leads through three-pole switches and fuses to the laboratory panel. A three-wire, single-phase wattmeter was connected in each lead as shown. A circuit-breaker was put in the outer wire of each single-phase lead, these breakers being mounted on the back of the panel convenient for the students to reclose any breaker after overload or circuit trouble was cleared.

The panel itself consists of nine sets of plug receptacles, each set comprising four contacts. It is evident that this panel gives a very convenient source



Wiring Diagram of Simple Single-Phase and Polyphase Laboratory Plug Board.

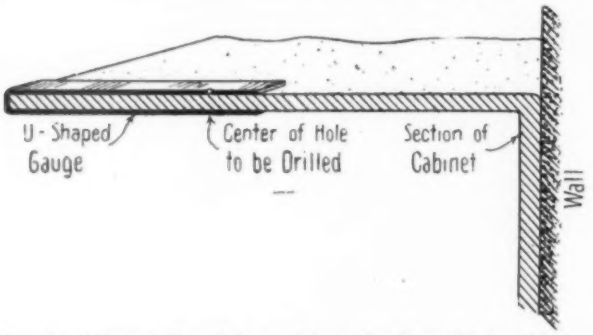
of either single-phase or three-phase power for miscellaneous testing purposes, the 115 and 230-volt connections being capable of giving numerous combinations in closed and open delta, star, etc. It also provides opportunity for experimentally demonstrating the relations of voltages and phase angles when connecting independent voltages, having 120-degree phase relations, in delta, star, etc. Although designed primarily as a laboratory board for students, it is

obvious that this simple panel is equally suitable for miscellaneous testing laboratories. In using it as a polyphase board, it is necessary to limit the combination to a single one, either delta or star-connected.

Simple Gauge for Transferring Marks on Steel Cabinets and the Like.

By Robert Oster.

Occasionally new electrical work is to be installed on panelboards, in steel switch and control cabinets and on different machines, etc., where there is much difficulty in working on the surface that the appliance is to be attached to. Frequently holes could be drilled, reamed and taped with ease on the opposite side of the



Simple U-Shaped Template or Gauge for Transferring Marks.

object being worked on, provided prick points or drill marks were transferred accurately and quickly from the side on which the work is layed out.

With proper tools and in the shop or on new work the transfer is a simple matter, but when work must be done on the job with a few tools and in creditable time the most simple and accurate method is desired.

Suppose a switch is to be mounted on the inside of a sheet-steel surface cabinet and on the side of the cabinet. The switch is located and marks made where the holes are to be drilled for securing the switch. To drill the holes from the inside is not only difficult but dangerous, as there will probably be exposed current-carrying parts in the cabinet.

Take a piece of tin or galvanized iron or other metal, 3 or 4 inches wide and of sufficient length to reach twice from the edge of the cabinet to a short distance beyond farthest hole mark and to accommodate the thickness of the wall, holes are to be drilled through. By bending this metal in the form of a square-corner U of width at the base to accommodate thickness of the article being worked on, a template or transfer can be made. Punch or drill a small hole through both strips of metal near its tips or ends that would correspond to the tips of the letter U. These holes must be exactly in line.

Now straddle the edge of the cabinet with the U-shaped template and bring hole of one metal tip to a point directly over one of the marks; hold the metal there securely and mark the opposite side of cabinet through the hole in other tip of the template or gauge. By moving the gauge to other marks and working as before any number of points or marks wanted can be transferred. The cabinet can now be drilled from the outside and holes should line up with the original marks on the inside.

Care must be taken not to twist the gauge out of line lengthwise and this can be guarded against by using wide metal, for it is obvious that a 1-inch strip will be less rigid than a strip 3 or 4 inches wide.

Among the Contractors.

The Doerr-Mitchell Electric Company, Spokane, Wash., was awarded the contract for installing the electrical fixtures in the Grant County Court House at Ephrata, Wash., on a bid of $1200.

The Merrill-Sharp Electric Company, 1215 Bolivar Road, Cleveland, Ohio, will do the wiring for a combined sales and service station and garage owned by J. A. Wigmore & Company, of Cleveland.

The G. E. Engineering Company, Inc., 417 Canal Street, New York City, has the contract for installing an electric duct system for the Navy Department's big projectile plant at Charleston, W. Va., at a contract price of $8988. This is supplementary to the company's contract for installing the power distribution system at a price of $26,711.

Fitch Electric Company, 1005 East 105th Street, Cleveland, Ohio, has been awarded contracts for electrical work in two residences for C. Snyder, 1377 Lakeview Road, and one residence for E. W. Schellintrager, 930 Lakewood Road. The company also has the contract for electrical work in a salesroom and garage for the Kenyon Paint Company, at Euclid Avenue, near Sixty-first Street, Cleveland.

The Home Electric Construction Company, with stores at Beardstown, Bushnell, Macomb and Rushville, Ill., has just opened up a store at Havana, Ill. Macomb is the main office. At present a good business is being done. Among the contracts is a conduit-wiring job being done for a seven-story concrete flour mill under erection in Beardstown. W. I. Savidge is president and general manager of the company.

Matthews Electric Supply Company, Birmingham, Ala., is now located in larger quarters at 2014 First Avenue. The building in which the company is now located has been turned into one of the finest equipped in Birmingham for handling electrical goods. One of the company's featured appliances is the Eveready dry battery. The officers of the company are H. W. Matthews, president; Fred Sintes, vice-president and general manager, and C. R. Matthews, secretary and treasurer.

Muskegon Electric Company, of Muskegon, Mich., managed by Edward J. Duquette, has the Armory electrical contract at that place. This is a conduit job, in which the Buckeye conduits are used throughout the building, which is a brick, concrete and millwork structure. Adaptiboxes and Cutter cabinets are being put in. This company, to which was awarded two years ago the contract for installing the electrical equipment in the new post office building, now has the work in progress. The contract covers the wiring and cables for lighting, power, vault-protection service, and for telephones. Frank Adam cabinets and M. B. Austin Company's special wire are adopted. The power required is a seven-horsepower motor for ventilating fans and several motors for adding machines and other facilities. The electrical work on the Ursuline Academy building has been completed, in which steel conduits of the American Conduit Manufacturing Company, Pittsburgh, were installed, and found well suited for rewiring purposes. This company also has completed the wiring for the Rialto Theater, Muskegon, in which 600 lamps of an average of 25 watts each were installed. The conduit wiring also extended to five motors of 10 horsepower in all, for ventilators and picture machines and for a sewage-flushing system. The motion-picture machine is operated from a small motor-generator set.

National Association of Electrical Inspectors

WASHINGTON DEVEREUX, President, 131 South Fourth Street, Philadelphia, Pa.
JOHN KELLY, JR., Vice-President, Camden, N. J.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.

R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, J. C. Digby, British Columbia.
A. W. Hopkins, L. N. Heebner, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
H. S. Wynkoop, M. L. Pomares, New York City.
B. C. Hill, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Velt, Cleveland, O.

"LET THE CODE DECIDE."

SECRETARY'S MESSAGE.

The secretary desires to apologize for the lapse of time since his last communication, but it has been very slow work getting any questions for the Question Box and still slower getting in the replies; indeed, although the question bulletin from which the two appearing herewith were taken was sent out the last week in October, less than a third of the Executive Committee have replied at the date of this writing (November 24). I presume that nearly all offices are shorthanded and overworked and that very likely we should be thankful so many were able to get the time to reply at all.

The secretary received recently from H. A. Knight, supervisor of wires, Worcester, Mass., a very curious sample of lightning effects. It is a piece of No. 14 rubber-covered wire about ten inches long which Brother Knight himself removed from a circuit just after it had been subject to a lightning disturbance. It is clean cut with the pliers at one end, and about two inches from the other end the braid is gone on one half the circumference for a distance of about an inch and the rubber compound split open; very faint traces of fused copper can be seen with a magnifying glass at the edges of this rent. *But not a trace of the copper conductor remains throughout the entire length of the sample,* and except as stated above the insulation and braid is *intact.*

Brother Knight writes: "Can anybody explain where the wire went to without burning up this length of insulation from which the inclosed sample was taken? There is one question for you, and a good one."

Has anybody heard of anything like this before, and what is the answer to Brother Knight's question? Let us hear from the floor.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee, according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

WIRE FOR COMBINED CONDUIT AND OPEN CONSTRUCTION.

Question 351.—If a line of No. 4 slow-burning insulated wire is to be run open in mill construction and it is found necessary to go through one room in conduit for a distance of about forty feet, would it be necessary to use No. 2 double-braid rubber-covered wire in the conduit and ground same, it being near the ceiling like the open wire?

Answer 1 (T).—In case the conductors are subject to moisture, the Code would require having a rubber insulation either run open on porcelain or placed in metal conduits; should it be a question of protection for the conductors against mechanical injury, the wire with slow-burning insulation could be carried through the room in question, the conductors being protected as required by Rule 26*e* of the Code.

Answer 2 (V).—No. 4 rubber-covered wire can be used if the circuit is protected by 70-ampere fuses, or circuit-breaker.

Answer 3 (O).—Slow-burning wire in conduit as described would very positively be a violation of the Code, as would also the use on a ceiling of conduit not properly grounded.

Answer 4 (K).—Yes.

Answer 5 (H).—It would, I think, be well in this case to carry the slow-burning wire through the conduit, protecting each wire by a circular loom running from porcelain to porcelain at either end of the conduit.

Answer 6 (F and G).—Where a circuit is wired with a combination of slow-burning and rubber insulation, Tables B and A of Rule 18 would apply respectively, which in the particular case referred to would require rubber-insulated wire of No. 2 B. & S. gauge in connection with No. 4 slow-burning insulated wire, both having the same allowable capacities, and would avoid possible depreciation or injury to the rubber insulation.

Answer 7 (B).*—Under the rules it would be necessary to use rubber-covered wire in conduit and properly ground said conduit.

Answer 8 (E).—Under the conditions expressed

in this question we feel that rubber-covered wire having a double-braid jacket should be used in a conduit forty feet long, and we should also suggest that the conduit be grounded.

Answer 9 (*S**).—Our municipal rules would require conduit work.

Answer 10 (*N**).—In such a case as this my ruling would depend upon the temperature and occupancy of the room. On general grounds I should require the wire to be No. 2 double-braid rubber-covered and the conduit grounded; the fuses which protected the main work would then protect the rubber-covered wire as well and none would be needed where the change in wire size was made.

On the other hand, this precise case occurred in my territory a few years ago where the line passed through a drying room in a chair factory and was put in conduit near the ceiling to protect the wires from possible damage when boards were being stacked in the room. In this case the slow-burning was used, the conduit being firmly grounded to the heating pipes.

Wiring for 2300-Volt Induction Motor.

Question 352.—We are about to install the wiring for a 100-horsepower 2300-volt four-wire two-phase motor. It is to be located in a building about 12 feet wide by 30 feet long, formerly an old engine room, with four brick walls and a regular wooden roof. There is usually, but not always, an attendant in the room. The motor is to drive a 220-volt direct-current generator, which the engine used to drive.

Is this to be considered a substation, or shall we assume it not to be such and consequently use lead-sheathed 2300-volt, four-conductor cable in the conduit, instead of a single-conductor, 2300-volt rubber-covered wire? Are the cartridge fuses all that is necessary at entrance, or do we need a four-pole, 2300-volt switch in a steel box?

Will a pothead be necessary at entrance or can we use a type C Condulet, perhaps filled with paraffin? The fuses are special, inclosed in cast-iron individual boxes, hinged with porcelain handles.

Answer 1 (*T*).—Under Code Rule 8, section *b*, fourth paragraph, the engine room might be considered as a motor room and permission could be given for open wiring on porcelain supports and conductors, where subject to mechanical injury, placed in conduit in accordance with rules for this class of wiring.

Answer 2 (*V.*).—I would not consider this a substation, and would use lead-incased cable in conduit. A four-pole switch in steel box will be needed besides the fuses. A type C Condulet would be all right if properly installed.

Answer 3 (*O*).—Under a liberal interpretation of Rule 8, the installation described might be approved with open wiring, but I should judge it to be the inspector's duty to use every possible means at hand to discourage such work, except in fireproof vaults or motor rooms. Owing to the very serious life hazard involved in the use of high voltage for ordinary industrial purposes, the inspector's responsibility is quite heavy and if local laws or ordinances do not require conduit work and complete inclosure of all wires and apparatus, then sufficient authority should be found in the National Electrical Code or the National Electrical Safety Code for insisting on the very best grade of inclosed construction. The installation as described above is faulty in that wires are used exposed, first at the fuses, second at the oil switch, third at the motor. The use of cartridge fuses in separate cast-iron individual boxes is good, provided the fuse can be withdrawn by removing cover of the box and without touching the fuse itself. It would be much better, however, to use an automatic oil switch to take place of both switch and fuse. In the installation as described an extra switch would be required at the entrace to comply with Rule 24 *a*.

It is probable that a service Condulet filled with paraffin or an approved compound could be used with entire safety where the service wires enter service conduit, although a pothead would perhaps be better.

Answer 4 (*H**).—A substation is one to which current is brought from a generating point, usually at a high potential, there used to generate or transform current for use at a point farther from the original source of supply. If, as was described, the service conduit brings power from another generator, this place would, I think, come within the definition above noted, and as such should be wired in accordance with the rules governing substations. It would be well to use a four-pole, 2300-volt switch in a steel box at the entrance. A pothead would be advisable.

Answer 5 (*K*).—An installation of this kind should be considered a substation, if under the care of a qualified person; therefore lead-sheathed conductors would not have to be used. Our regulations would require a metal-armored installation and that an approved externally operated switch be placed ahead of the entrance fuses and all cutouts be inclosed in an approved cabinet. A type C Condulet turned face down and filled with paraffin would be approved in place of a pothead.

Answer 6 (*F and G*).—We take the position that a substation is a part of or under the control, ownership or management of the central station, and as the particular installation referred to does not come under this heading the multiple-conductor lead-sheathed cable should be used. We would consider a Condulet properly filled to be the equivalent of a pothead as permitted under the rule. A service switch should be installed at the point of entrance as required under Rule 24, section *a*.

Answer 7 (*B**).—If I understand conditions properly, I should consider this a substation, and would expect the installation to conform to rules for substations.

Answer 8 (*E*).—We would not consider it as being a substation, but would class it as an industrial plant, in consequence of which multiple-conductor lead-sheathed cable should be used, the cable being installed in conduit. We do not understand 2300-volt cartridge fuses are intended for general use, and in view of the life hazard of replacing them would not approve of them. In their stead we would suggest the use of an oil circuit-breaker, which could also be used as a service switch. A pothead or other terminal equally good should be used at the end of the conduit. The sketch does not show the conduit entering and secured to the casing of the oil switch as required by Rule 8.

Answer 9 (*S**).—Our municipal rules and regulations would require this all in conduit.

Answer 10 (*N**).—This is a border-line case and the question might turn upon the rights of the supply company in the premises. If this is the only apparatus on the premises, and no one is allowed in the room but the engineer, I would unquestionably class it as a substation and require its wiring in all respects to follow the rules for such. If, on the other hand, it was accessible to any employee of the plant, or more or less a thoroughfare, as engine rooms frequently are, I would require the other form of wiring and protection.

New Appliances

Phonograph Record Lamps—Panel Switches—New Steam Trap—Voltage Regulator—Line-Drop Compensator—Electric Planer

Universal Record-Lite for Phonographs.

The phonographs so commonly found in household use are played in the evening probably more than at any other time during the day and usually are placed in some dark corner, where the setting of the needle is done in a rather hit-or-miss fashion, resulting in considerable scratching of the records. To overcome this difficulty there was placed on the market less than a year ago a small self-contained electric lamp, known as the Record-Lite. It was designed especially for use with Victrola phonographs and consists of a small

Record-Lite for Victrola Phonographs.

battery box, containing dry cells in series amounting to four volts. A flexible cord connects from the battery terminals to the lamp holder, which is arranged so it can be easily slipped over the end of the tone arm until it snaps into position and is ruggedly fastened. The contact spring on the lamp housing constitutes a simple switch for turning on the light. This contact is so placed that when adjusting the needle the second finger of the left hand rests in a natural position upon the contact spring. A slight pressure of the finger thereby causes the lamp to light. The needle can be accurately placed in the proper groove and the automatic stop can be correctly adjusted. Release of the hand causes the light to be extinguished. The lamp is lighted only a short time, consequently the life of a set of batteries is quite satisfactory.

Universal Record-Lite for Any Phonograph.

The favor with which this Record-Lite was received by users of Victrola instruments has caused the manufacturer of the device to make a similar outfit that can be used on practically any other type of phonograph, including the Victrola. This is known as the Universal Record-Lite, which consists of an upright stand with a reflector near the top. It is operated in a similar manner to the one just described. Both of these devices are neatly finished in either nickel or gold and manufactured by The Record-Lite Company, Inc., Manhattan Building, Milwaukee, Wis.

Dead-Front Panel Switches With Connections for Cartridge Fuses.

The Bryant Electric Company, Bridgeport, Conn., announces an addition to its comprehensive line of dead-front panel switches. Devices of this character, both in the rotary and push-button types, have been in use for some time. These, however, have been fitted with connections for plug fuses. Now, where the conditions do not permit of the use of plug fuses, as, for instance, on circuits above 125 volts, a Bryant panel unit can be had with connections for cartridge fuses. The great convenience and economy of these switches is readily apparent when it is borne in mind that, with a small quantity of units in stock, a dealer or contractor is enabled to provide for the immediate assembly of a panelboard of practically any number of circuits without requiring special mounting, or the collation of a number of different parts.

Each unit is complete in itself, consisting of a substantial porcelain base, upon which are mounted two demountable switch mechanisms with fuse connec-

Bryant Dead-Front Panel Switches.

tions, all ready for connecting to the circuits. Aside from the feature of convenience, the method of affording safety against shock to the operator is worth noting. The entire front of each unit is fully protected by substantial sheet fiber. This effectively covers and protects all live parts so that it is impossible for a careless or thoughtless operator to get a shock.

The covers or fronts of these units are regularly furnished in black enamel, but may be had in other finishes when specified.

Positive-Acting Steam Trap.

The condensation of steam and the collection of water in steam pipes lowers the efficiency of a plant, reduces the capacity of steam lines and apparatus and also constitutes a danger. Steam traps are used to prevent these things from occurring, and to accomplish its purpose best a steam trap should be able to dis-

Fig. 1.—The Fisher Steam Trap.

charge all condensate as rapidly as it occurs, and without allowing the wasteful escape of steam.

The Fisher steam trap, developed by the Fisher Governor Company, of Marshalltown, Iowa, is claimed to accomplish this. The working of the steam trap can be understood by referring to Fig. 2. Water accumulates in the body of the trap until the high-water mark is reached, when it then flows over into the non-collapsible bucket. This bucket sinks as it fills, and in sinking operates the auxiliary valve. Immediately the valve operates the pressure in the trap is discharged through the wide open valve until the water level again reverts to the low water mark. Enough water is retained in the trap at all times to form a perfect water seal, making the escape of steam impossible. The bucket is made of cast iron and is of the open bucket type, thus at once eliminating all the troubles due to ball floats and similar types. The auxiliary valve likewise is free from trouble as it is located at the top of the trap and, being exposed to steam temperatures, is not subjected to corrosion or unequal expansion and contraction. Two blow-off connections are located at the bottom of the trap to permit dirt and sediment being removed quickly and easily without interfering with the remaining mechanisms of the trap.

The trap works under gravity with buoyant and positive action. There is intermittent action which eliminates chance of wire-drawing. There are few working parts, making for durability and reliability. The shape and details of the trap have been designed for maximum strength, simplicity and efficiency. Reinforced ribs and uniform thickness of shell are used to protect against expansion and contraction of steam lines under temperature changes, the ribbing also making it a simple matter to apply asbestos covering for reducing radiation losses. The trap has been designed for pressures from one pound to the highest pressures and degrees of superheat as yet advocated.

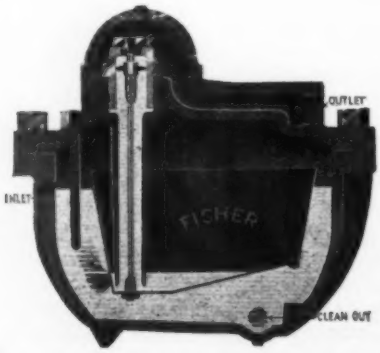
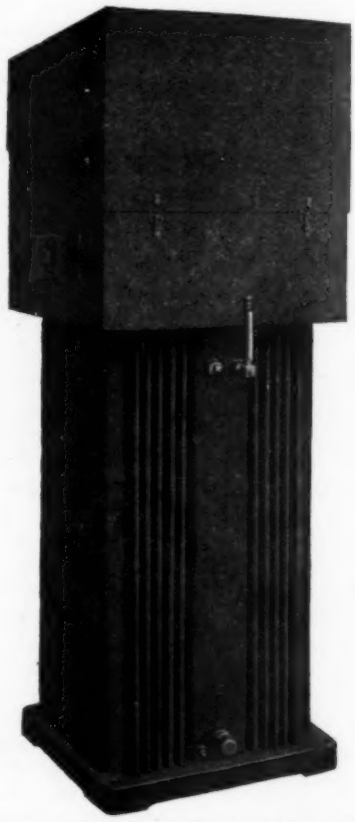


Fig. 2.—Cross-Section of Fisher Steam Trap.

New Westinghouse Outdoor Type Induction Regulators.

The increase in recent years in the number and length of alternating-current transmission systems and and distribution networks makes the need of voltage-regulating equipment essential, if proper service is to be given to consumers. The following conditions, frequently met with in practice, can be greatly improved by such equipment and are best taken care of by means of outdoor-type voltage regulators: First, a long feeder circuit serving scattered loads, such as is found in suburban districts; second, branch circuits tapped off a main feeder; third, lighting circuits tapped off a feeder carrying a power load—in this case a feeder regulator will prevent fluctuation of lamp voltage as the power load changes; fourth, lighting circuits taken from a transmission line through step-down transformers.



New Outdoor Type Induction Feeder-Voltage Regulator.

The new outdoor type C Westinghouse induction feeder-voltage regulator provides a means of obtaining such voltage regulation in outlying districts or any other part of an alternating-current distribution system without the expense of hoisting or attendance. Being entirely waterproof and self-contained, one of these regulators may be mounted on a platform constructed on poles or on the ground protected by a suitable fence or screen. The only attention required will be a general inspection for oiling the motor bearings and worm-screw mechanism, filling the grease cups and examining the relay contacts at long intervals.

This outdoor induction regulator consists essentially of a standard type C regulator of the familiar

form used for indoor service. The following modifications have been made to adapt it for outdoor service: A steel housing is securely mounted on the top of the regulator tank. This completely incloses the regulator top cover on which, in addition to the operating motor mechanism and secondary relay, are also mounted the primary relay, resistor and any other accessories required.

This steel housing has a hinged cover to facilitate inspection of the appartaus which it incloses. The edge of the top cover of the housing when closed extends down over the edge of the bottom part of the housing and a shoulder with gasket forms a moisture-proof joint. The housing is mounted on the regulator tank in such a way that it does not interfere in any way with the easy removal of the regulator from the tank.

In most cases the proper location of such a regulator is at the center of distribution of the feeder circuit, that is, as close to the load as possible. When thus installed the regulator with proper setting of the primary relay will hold the voltage at the point where it is located at a predetermined value. Hence a line-drop compensator and potential transformers are usually unnecessary. An outdoor-type voltage transformer must be provided and also a low-voltage alternating-current circuit for the operating motor.

This regulator has the advantage that all the accessories are mounted in one compartment with all the interior wiring complete when the regulator is shipped. The regulator is designed for 10 per cent regulation on 2300-volt feeder circuits, and is furnished in four standard sizes, 5.75, 11.5, 17.25 and 23 kilovolt-amperes; these ratings correspond to 25, 50, 75 and 100-ampere feeders.

Line-Drop Compensator.

When automatically operated induction regulators are used for compensating for line drop on lighting feeders supplying a non-inductive load, or a constant-power-factor inductive load, correct results will be obtained when the regulator is controlled by a contact-making voltmeter having a compound winding. On feeders supplying a varying-power-factor load, however, the compound winding of the voltmeter will correctly reproduce in miniature the resistance drop as existing in the feeder, but not the reactive drop. Consequently, to obtain correct compensation for the latter condition of operation, which is being adopted more generally by central stations, it is necessary to use in conjunction with the contact-making voltmeter a device which will reproduce in miniature on the voltmeter the resistance and reactance drop as found in the line under varying condition of load and power-factor.

The General Electric Company has recently developed a new line-drop compensator as shown in the cut herewith. This compensator when used in connection with any contact-making voltmeter will enable the regulator to provide correct voltage compensation to any given point on the feeder regardless of the load or the power-factor. The compensator consists of a resistance and a reactance, each independently adjustable by means of dial switches, whereby the resistance and the reactance of the line may be reproduced in miniature and the effect of the load on the line reproduced in the feeder-regulator control, that is, in the contact-making voltmeter.

The compensator can be furnished either with or without a one-to-one insulating transformer, the latter design permitting the grounding of both current and

General Electric Line-Drop Compensator.

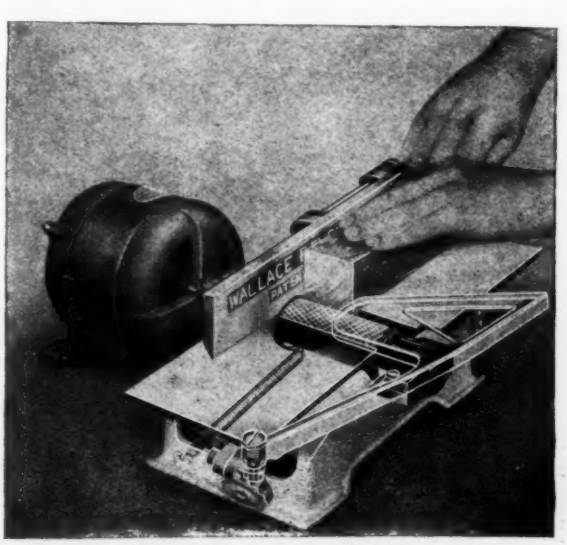
potential-transformer circuits. It can be connected in circuit with any contact-making voltmeter of General Electric manufacture without any change in the meter regardless of the type or design, and once properly adjusted for the line will cause the regulator to maintain correct voltage within its limits of range and capacity.

The units of the compensator are assembled in a neat, compact case suitable for mounting on the switchboard, if desired. It is easily adjusted, and after correct conditions are obtained for a given feeder requires no further attention.

A Portable Motor-Operated Bench Planer.

J. D. Wallace & Company, of Chicago, Ill., has developed a portable motor-operated bench planer and joiner for light woodworking operations. The device and motor are a single unit with direct drive through a flexible coupling which delivers approximately 100 per cent of the power applied. Current to actuate the motor which supplies power is obtainable from any standard electric light socket.

A feature of the machine is that three knives are operated on the cutter head, if an alternating-current motor is used, and two, if a direct-current motor furnishes service. The direct-current motor makes 4000 revolutions per minute and the alternating-current motor 3600. Fractional-horsepower motors made by the General Electric Company are used. They are standard equipment and can be used on practically any frequency of current supplied.



Portable Electric Bench Planer.

Trade Activities

Many Instructive Bulletins and Catalogs Being Issued by Manufacturers

Sprague Electric Works, Bloomfield, N. J., has taken out a building permit for the erection of a new addition to its plant.

Allen-Bradley Company, 495 Clinton Street, Milwaukee, Wis., has recently issued a number of new bulletins dealing with its electric controlling apparatus. Among these are the following: Bulletin B-70 on alternating-current automatic starters for phase-wound motors; B-4 on direct-current overload motor-starting rheostats; B-3, direct-current motor starters above 150 horsepower; B-5, direct-current motor-starting panels of the overload type; B-50, single-phase motor starters; B-62 and B-63, alternating-current primary-resistance-type motor starters, of the standard and gradual-start type. Each of these bulletins is well illustrated and gives a detailed description of the operation of the particular controlling device and its construction.

Tubular Woven Fabric Company, Pawtucket, R. I., is distributing copies of the opinion rendered by Judges Dodge, Bingham and Aldrich, in the United States Circuit Court of Appeals for the First District, in the case of the National Metal Molding Company *vs.* Tubular Woven Fabric Company, this being an appeal respecting Osborn patent No. 652,860 on flexible electrical conduits. This opinion upholds the decision of the District Court, which decided that the use of cotton yarn as the helical strand of Duraduct was permissible. The Tubular Woven Fabric Company had substituted this cotton-yarn strand for a paper-twine strand, in compliance with a decision of the court about a year ago, which found that the paper-twine strand was an infringement of the Osborn patent.

Wirt Company, Philadelphia, Pa., is sending out a catalog on its products bearing its trade name, Dim-A-Lite, issued for dealers' use exclusively. This booklet gives full details and complete information on every appliance which can be had with the Wirt reputation backing up the design, quality and workmanship. Among products illustrated and described are Dim-A-Lite attachments; uses for Dim-A-Lite fixture sockets, including portable; regulating sockets, including Continental type for export, also British or Bayonet cap type; Di-El-Ite resistance and weatherproof resistance units and mountings for same; fuse type resistors; box-type and cylindrical iron-clad units. The catalog also contains a photographic reproduction of a report of test made by the Department of Commerce Bureau of Standards, Washington, D. C., showing exactly what the Dim-A-Lite saves in current at the various changes of light. The catalog is of convenient filing size.

Westinghouse, Church, Kerr & Company, Inc., engineers and constructors, 37 Wall Street, New York City, with branch offices in Chicago, San Francisco and Montreal, are sending out a fine pencil sketch of the coaling station on the Sound they recently built for the Winchester Repeating Arms Company. Even before the United States entered the war these engineers were prominently engaged with important work for industries to make it possible for them to meet the war's demands. They had been working continuously for five years for the Winchester Repeating Arms Company and this work included a total of 54 separate agreements, 53 repeat orders, which involved engineering and construction of almost every variety. A few of the projects built by Westinghouse, Church, Kerr & Company are a complete arsenal, extension of another, a small arms plant, a complete powder plant, two shell loading plants, an airplane motor plant, a nitrogen fixation plant, a sulphur mining plant, etc. The beginning of the continuous work for the Winchester people was in 1911, when a gas-producer plant was built. The Winchester engineering department has been heavily taxed with duties but through the co-operation of these expert engineers it has employed its own technical men in the most effective way and rapidly built and enlarged plants.

General Electric Company of Michigan is supplying a number of Grand Rapids shops with the motors for woodworking machine tools, which are being built for Navy yards.

National Lamp Works of General Electric Company, Cleveland, Ohio, recently completed a lamp factory on Oakley Boulevard between Harrison and Flournoy Streets, Chicago, Ill., in record time. The structure, which is 80 feet wide and 240 feet long, was started August 13, when ground was broken, and completed by November 1, practically 15 days ahead of contract requirements. The building has a total floor space of 80,000 square feet and in it will be manufactured national Mazda miniature lamps.

Condensite Company of America, Bloomfield, N. J., has issued a very well illustrated booklet on the products that it manufactures. Chief among these is Condensite, which is a phenolic composition with many valuable properties, of which its ability to be accurately molded and its high dielectric strength are especially important. Of the large number of illustrations many show parts of electrical machines, especially parts of meters, ignition distributor plates, ignition generator parts, terminals, parts of starting motors and lighting generators, busbar insulators, bushings, etc. Of course this material is also useful for a great many non-electrical purposes, including even printing plates and matrices.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing the second of a series of catalogs of industrial motors. This is known as catalog 30 and covers the company's complete line of direct-current motors and generators for industrial service. Several pages are devoted to general information regarding the ordering, classification and selection of direct-current motors, which are followed by a complete description, rating and dimensions for type SK commutating-pole motors, various modifications of type SK motors and SK elevator motors, reversing planer motor equipment, type CD motors, headstock equipment for woodworking plants, types SK and CD motor generators and arc welding equipment. Much new information is given, especially on such subjects as arc welding, headstock equipment, motion picture service, industrial service and battery-charging service. The new catalog is identical in size and will fit the binder for the company's line of catalogs covering supply apparatus and small motors.

National Lamp Works of General Electric Company, Cleveland, Ohio, has issued a booklet entitled "How to Sell Mazda C-2 Lamps." This booklet first gives a good description of the characteristics and special adaptability of this type of lamp. It discusses average daylight and the use of filters for obtaining it from various illuminants. Graphic spectrum curves are given in colors in this connection. It is shown that the equipment necessary to use in Mazda C-2 lamps is very simple. The bulk of the booklet is devoted to a discussion of the various kinds of service for which these lamps are recommended, the substance of this being that wherever light that is a fairly accurate match for average daylight is desirable Mazda C-2 lamps are suitable. A large number of classes of installations where these lamps should be used are described, these including automobile showrooms, cotton and other textile mills, laundries, department stores, display windows, millinery and tailor shops, certain industrial plants where color appearance of the material is an important factor, chemical and other laboratories where a close approach to daylight is necessary, art galleries and studios, libraries, drafting rooms, beauty parlors, etc. The booklet also points out what is to be emphasized and what avoided in selling these lamps. The wattage requirements of the C-2 lamps as compared with other lamps are given, as well as other valuable illuminating hints necessary in making a satisfactory installation. The booklet should be of value to all interested in selling the most up-to-date illuminating appliances.

Men in Service

Northwestern, Byllesby, Telephone and Rubber Companies Well Represented in Service—Charles A. Piez to Assist Chairman Hurley

WALTER WICKENHEISER, 311 East 193rd Street, New York City, interested in the electrical industry, has joined the colors to serve in the U. S. Army.

BRODERICK & BASCOM ROPE COMPANY, with main office at St. Louis, in its December issue of The Yellow Strand, lists the names of 12 men who have entered service.

E. R. MEYROWITZ, a member of the Freydberg Bros. selling force, New York City, has joined the Army, at present being in the training camp at Yaphank, Long Island.

CHARLES A. SCHIEREN COMPANY, tanner and manufacturer of the famous Duxbak belting, is floating a service flag at its headquarters, 69 Cliff street, New York City, bearing 29 stars.

INTERBOROUGH RAPID TRANSIT COMPANY, New York City, is displaying a service flag with 1260 stars, representing that many of its employees in active service under the colors of Uncle Sam.

UNITED STATES RUBBER COMPANY'S service flag, flying from the third floor of its 20-story building on Broadway and Fifty-eighth Streets, New York City, bears 1544 stars and new stars are being added every week, representing employees in Government service.

LESLIE R. COFFIN, manager of the Whatcom County Division of the Puget Sound Traction, Light & Power Company, having his headquarters at Bellingham, Wash., has been asked to report for duty at the American International Shipbuilding offices in Philadelphia, of which Charles A. Stone, of Stone & Webster, is president. This company is constructing a large number of ships under Government supervision.

P. K. CONDICT, who was foreign sales manager of the Western Electric Company, last summer gave up his work for the company, in order to help the Government with some of its shipping problems. He was first connected with the Department of Commerce and now is assistant director of Bureau of Exports, and in charge of the Bureau's work in New York. Owing to his splendid experience in this line of work he is in position to render valuable service.

B. F. GOODRICH RUBBER COMPANY'S large service flag at Akron, Ohio, bears 751 stars, of which numbers the majority represent men who enlisted or entered training camps. Some of these stars represent boys in France, now with Gen. Pershing's expedition. The value of the employees of the rubber industry, particularly those attached to the truck tire and electrical departments, not overlooking those who make insulated wire cabling, to the Government has been indicated by their assignment to such divisions as the motor truck and signal units. Many of them have been given commissions because of their knowledge of the manufacture of the equipment with which they are dealing.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW will *welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

F. A. C. TOCQUE, formerly district salesman of the Louisville Gas & Electric Company, Louisville, Ky., and more recently commercial manager of the Ft. Smith (Ark.) Electric Light, Power & Traction Company, has sailed for England, where he will enter military service. Mr. Tocque is a native of England and took his 18-months-old daughter with him. Mrs. Tocque died recently.

NORTHWESTERN ELECTRICAL EQUIPMENT COMPANY, Duluth and St. Paul, Minn., in its December Northwestern Buzzer lists the names of its employees in Government service as follows: Douglas A. Fell, Company C, 310th Field Signal Battalion, Enlisted Reserve Corps, Camp Custer, Battle Creek, Mich.; Donald Hough, Company B, 309th Field Signal Battalion, Camp Taylor, Louisville, Ky.; J. Johnson, Railway Engineer Corps; Harry P. Kanthack and G. C. Rosness, electricians, U. S. Navy, Brooklyn, N. Y.; J. J. McFetridge, U. S. Aviation Training Camp, Texas State University, Austin, Tex.; George V. Miller and K. B. Van Bergen, Officers' Reserve Corps, Fort Snelling, Minn.; D. R. Napier, Quartermasters' Department, Camp Dodge, Des Moines, Ia.; D. T. Swift, Company L, 136th U. S. Infantry, Camp Cody, Deming, N. M.; E. S. Tallmadge, 2nd lieutenant, U. S. N. A., headquarters 313th Engineers, Camp Dodge, Des Moines, Ia. Corporal Robert A. Blumer of Company A, 9th Field Battalion Signal Corps, stationed at Camp Samuel F. B. Morse, Texas, has been recommended for the Third Officers' Reserve Training Camp. Obert Olson is now Private Olson in Headquarters' Company, 351st U. S. Infantry, stationed at Camp Dodge, Ia.

W. L. JOSEPH, an electrical contractor, 115 East Forsyth Street, Jacksonville, Fla., has enlisted in the United States Army.

CHESAPEAKE & POTOMAC TELEPHONE COMPANY and associated companies, with headquarters at Baltimore, Md., in a recent issue of its "Transmitter" encloses a three-page supplement of portraits of 78 of its men who have joined the colors, being with Company D, 403rd Telegraph Battalion. Besides the names and the plant they have been connected with, printed beneath the portraits, each has been given a sobriquet, proclaiming his popularity.

H. M. BYLLESBY & COMPANY have parted with a number of its men for Government service. From the Chicago office, which has about 100 men in its employ, 23 have voluntarily entered service. In addition to the 23 four others indirectly connected with the company are in service voluntarily. The Chicago list, headed by Major H. M. Byllesby, includes a brigadier general, a captain and a number of first and second lieutenants. Five men recently commissioned lieutenants as a result of their training in the Second Officers' Reserve Training Camp are Chester C. Levis and A. S. Cummins, of New York, and A. H. Sayce, C. E. Noerenberg and A. H. Kuhn, of Chicago. John McGrath, of the finance department, has enlisted with the U. S. Regulars as a private and joined the Army at Jefferson Barracks, St. Louis, Mo. Robert Nowland, formerly with the San Diego Consolidated Gas & Electric Company, at San Diego, Cal., a subsidiary of the Byllesby company, is now a member of the U. S. Aviation Corps, stationed in the training camp at Foggia, Italy.

GREGORY ELECTRIC COMPANY, with offices, warehouses and works at the corner of Sixteenth and Lincoln Streets, Chicago, reports a number of its employees having enlisted in the National Army, as follows: F. W. Stahl, Brooklyn Navy Yard, Brooklyn, N. Y.; Clements F. Krueger, Second Engineers, Company C, A. E. F., and Felix Bukowski, Company B, 16th Infantry, A. E. F., who are "somewhere in France"; O. Gauthier, Seventh Regiment, I. N. G., Camp Logan, Houston, Tex.; George Sporar, 111th Illinois Engineers, Camp Grant, Rockford, Ill.; Joe Hanurzewski, Company I, 129th U. S. Infantry, Camp Logan, Houston, Tex.; H. Lamb, J. P. Ellenbecker and A. Kounat, whose present location is not known; J. B. Zook, U. S. S. Arizona, New York City, N. Y. Mr. Zook is the son of J. D. Zook, general superintendent of the company, of Chicago. Young Zook has just been promoted to Chief Electrician on the Battleship Arizona. He studied electrical engineering at the University of Illinois, later obtaining valuable experience with the Gregory Electric Company. He enlisted in service about two years ago.

BURRITT A. PARKS, junior member of the engineering firm of Byron E. Parks & Son, Grand Rapids, Mich., received a captain's commission in Engineers' Reserve Corps two months ago, and was ordered to report at Washington, D. C., and recently was placed in charge of designing the heating, lighting and sanitary equipment in buildings to be constructed for the U. S. Army quarters in France. These include the cantonments, officers' quarters, supply depots, repair shops and field hospitals. Captain Parks is a graduate of the University of Michigan.

SOUTHERN TELEPHONE NEWS, published in the interest of the employees of the southern group of Bell telephone companies, in the November issue has 24 portraits of its boys who volunteered for Army service and 12 portraits of men in the Signal Corps. The names and division the volunteers were connected with are as follows: Alexandria, La.—W. H. Bolling; Anderson, S. C.—R. A. Bowen, J. B. Redfern; Atlanta, Ga.—T. M. Bulloch, C. T. Thompson, S. A. Mitchell, J. W. Poteet; Birmingham, Ala.—A. G. O'Neal; Cleveland, Miss.—A. A. Le Duke; Cleveland, N. C. F. L. Finison; Clarksdale, Miss.—J. T. Ross; Frankfort, Ky.—E. B. Russell; LaGrange, Ky.—P. H. Haley; Louisville, Ky.—W. G. Adair; Memphis, Tenn.—O. W Petway; Mobile, Ala.—Marc Molyneaux; Nashville, Tenn.—S. P Capps, E. A. Benk, E. Davis, H. A. Cragon Jr., H. C. Copeland; New Orleans, La.—K Lapyre; Savannah, Ga.—W. H. Grice; Winchester, Ky.—Vernon Bryant. In the Signal Corps are: Anniston, Ala.—A. H. Smith; Atlanta, Ga.—J. C. Pruitt, A. G. Day, J. L. Street, R. F. Hough; Charlotte, Ga.—I. R. Lackey, W. K. Wren; Louisville, Ky.—H. Edmondson; Memphis, Tenn.—B. M. Yates; New Orleans, La.—B. C. Baker; Raleigh, N. C.—J. M. Roberts; Vicksburg, Miss.—J. Brannon.

MOUNTAIN STATES TELEPHONE & TELEGRAPH COMPANY, Denver, Colo., in a recent issue of its Mountain States Monitor, lists more than 125 of its employees who are in service in the Signal Enlisted Reserve Corps, Companies D and E, Fourth Telegraph Battalion. The portraits of four of its fine young men are reproduced, who recently received commissions with the Signal Officers' Reserve Corps as follows: Capt. A. W. Young, Company D, 12th Telegraph Battalion, Denver, Colo.; 1st Lieut. Charles R. Kunsemiller, Company D, 12th Telegraph Battalion, Denver, Colo.; 1st Lieut. E. R. Hannibal, Company D, 12th Telegraph Battalion, Salt Lake City, Utah, and 1st Lieut. William E. Liggett, Company E, 12th Telegraph Battalion, Denver, Colo.

CHARLES A. PIEZ, president of the Link-Belt Company, Chicago, recently chosen to assist Chairman E. N. Hurley at Washington, D. C., with the work of the Emergency Fleet Corporation of the United States Shipping Board in speeding up the shipbuilding program, is an engineer of wide experience. The public has full confidence in his ability to handle judiciously and efficiently all problems that are continually arising in that field. Born September 24, 1866, he was graduated in 1889 from the Columbia School of Mines, New York City. That same year he entered the engineering department of the Link-Belt Engineering Company at Philadelphia, the company manufacturing elevating, conveying and power-transmission machinery. He successively became chief engineer, general superintendent and general manager of that company and in 1906 president of the Link-Belt Company, which is a merger of the related interests, the Link-Belt Machinery Company, of Chicago, the Link-Belt Engineering Company, of Philadelphia, and the Ewart Manufacturing Company, of Indianapolis, with general offices at Chicago. Mr. Piez is president of the Electric Steel Company, of the Illinois Manufacturers' Casualty Association, a director of the Illinois Manufacturers' Association, of which he was president from 1911 to 1913, and he is also a director of the State Bank of Chicago and the Drexel State Bank. He is a member of the American Institute of Mining Engineers, of the American Society of Mechanical Engineers and of the Western Society of Engineers. In 1911 he was chairman of the Illinois Workmen's Compensation Commission. He is a member of the Chicago, Commercial, Industrial, Midlothian Country, Union League and University Clubs of Chicago and Philadelphia. He is an enthusiastic golfer and enjoys riding, which are his favorite recreations.

Charles A. Piez.

WESTERN ELECTRIC COMPANY'S employees who have joined the colors since the last issue of its News are: From engineering department, New York—R. B. Lawrence and H. C. Mills, Aviation Section Signal Corps; H. W. Mower and P. E. Rollhaus, Naval Reserve; C. A. Mower, Naval Coast Defense; G. B. Small, U. S. Marine Corps. General accounting department, New York—A. Mayo, Jr., Reserve Signal Corps. General manufacturing department, Hawthorne—R. L. Combs and C. A. Herion, Reserve Signal Corps (Radio); J. B. Ewart, U. S. Naval; L. A. Homer, Naval Coast Defense; G. H. Kummerow, Reserve Signal Corps, and L. D. Seeley, U. S. Navy. General sales department, Boston—W. F. Daley and P. Hayes, Aviation Section, Signal Corps; J. B. Goad, National Guard; J. Gorman, Reserve Signal Corps. New York—J. C. Maxon, Naval Reserve. Philadelphia—H. H. Budd, Naval Coast Defense, and R. S. McKenna, U. S. Navy. St. Louis—A. S. Dowell, National Guard, and H. P. Ryan, U. S. Marine Corps. A number of letters received from boys in camps and at the front, and reprinted in the News, are all unanimous in their expressions that they are enjoying Army life.

NEW YORK TELEPHONE COMPANY in a recent issue of the Telephone Review lists the names of over 150 of its employees in Government service, who are members of the 2d Telegraph Battalion, S. C. U. S. R. The names and ranks of eight officers are given as follows: Maj. H. H. Shearer; 1st Lieut. B. K. Rhoades, adjutant; Capt. F. W. Mastin, commanding officer Company D; 1st Lieut. C. H. Bassler, Company D; 1st Lieut. C. B. Johnson, Company D; 1st Lieut. J. C. Chrisman, supply officer; Capt. J. M. Mellinger, commanding officer Company E; 1st Lieut. G. E. Hill, Jr., Company E; 1st Lieut. F. H. Van Winkle, Company E.

A. S. WITMER, engineer of sales of the Louisville Gas & Electric Company, Louisville, Ky., has been made manager of the commercial department. He will take the office December 15, relieving Robert Montgomery, first lieutenant of infantry of the National Army. Mr. Montgomery returned from the training camp late in November and resumed his duties at the offices of the company until the middle of December, when he is to report for duty at Camp Zachary Taylor, Louisville.

Personal

E. M. Olin Joins Copeman Company at Flint—F. H. Wilkins, Manager of Western Electric's European Interests Returns After Visit Here—Other Changes

JOHN B. PENNINGTON, Gloucester City, N. J., for the last four years chief engineer at the municipal waterworks, has resigned.

J. J. MOLYNEAUX, auditor for the Byllesby interests in the Southwest, has been appointed acting treasurer of the Minneapolis General Electric Company.

T. J. SPRAGLE, who has been with the Kentucky Utilities Company for a number of years, has been made manager of the company's business at Elizabethtown, Ky.

C. J. YORK, who has been division commercial superintendent of the Missouri & Kansas Telephone Company at Joplin, Mo., is now located at Coffeyville, Kans., representing the Southwestern Bell Telephone Company.

L. S. CAIRNS, for the last five years assistant general manager of the properties of the J. G. White Company in Manila, has been appointed general manager of the Eastern Pennsylvania Railways Company, Pottsville, Pa., and its subsidiaries.

CARL JOHNSON, direct factory representative at Grand Rapids, of the Howell Electric Motors Company, Howell, Mich., reports the installation of five of these motors in the plant of Grand Rapids Dairy Company, amounting to 50 horsepower; and eight Howell motors of 60 horsepower in the shops of Belding-Hall Company, Belding, Mich.

VICTOR F. KNADLER has been made electrical inspector of the City of Louisville, Ky., by the new city administration. His assistant for the next four years will be Claude E. Sewell. Both men were with the Harry I. Wood Company. At the same time the appointment of Daniel Breitenstein as elevator inspector for the city has been announced.

J. H. PARDE, president, and J. P. RIPLEY, railway engineer of The J. G. White Management Corporation, New York City, are visiting the Philippine Islands, making a general inspection of the Manila Electric Railroad & Light Company and other interests in the Islands operated by the Management corporation. They are expected to return to New York City about January 15.

HAL C. WYATT, who has been connected with the Northwestern Electric Equipment Company, of Duluth and St. Paul, for eleven years, for the last six years having represented the company in southern Minnesota, has been transferred to a larger field in Montana. He will represent the company in the Montana territory west of Havre on the Great Northern, and Miles City on the Northern Pacific and St. Paul roads. He succeeds W. H. Plum in that territory, who recently resigned.

ERNEST L. SHOTWELL, for several years superintendent for the Kentucky Utilities Company at Versailles, Ky., has been assigned to a similar office for the company at Somerset, Ky.

W. R. EMERSON, formerly auditor of Muskogee Gas & Electric Company, is now general auditor of all Oklahoma Gas & Electric Company properties, with headquarters at Oklahoma City.

F. J. H. KRACKE, Brooklyn, Commissioner of Plant and Structures of New York, and Charles B. Hubbell have been appointed acting Public Service Commissioners of the first district, taking the places of Col. William Hayward and Major H. W. Hodge, both of whom are in federal military service.

E. M. OLIN, formerly superintendent of the testing department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has

E. M. Olin.

been appointed superintendent and assistant treasurer of the Copeman Electric Stove Company, of Flint, Mich. This company is a recently acquired subsidiary of the Westinghouse company and manufactures the Westinghouse line of electric ranges. Mr. Olin is a graduate of Purdue University and entered the employ of the Westinghouse company in 1894 as an apprentice at the Garrison Alley plant, which was at that time the company's main works. After completing his apprenticeship course, he was made general foreman of the testing department, later being transferred to the engineering department, on designing work. For a time he was in the service department, but in 1910 was appointed assistant superintendent, and in 1913, superintendent of the testing department. Mr. Olin will have full charge of the works at Flint, Mich., and succeeds D. W. Ovaitt, resigned.

G. E. MARTIN, who was assistant professor of highway engineers at Purdue University, is now a captain in the U. S. Army. He has been succeeded in his duties by Prof. Ray C. Yeoman, dean of the engineering department of Valparaiso University.

JOSEPH MCKAY, JR., for 13 years with the Wheeler Condenser & Engineering Company, and for the last two years with the Pittsburgh Valve Foundry & Construction Company, has been engaged as general sales manager of the Deschangel Engineering Corporation, 90 West street, New York City.

L. B. WHEELER, of Minneapolis, Minn., who for the last two years has been assistant to C. H. Ritter of the Northwestern Electric Equipment Company, of Duluth and St. Paul, has been given charge of that company's southern Minnesota territory, formerly handled by Hal C. Wyatt, who is now looking after the Montana territory.

F. H. WILKINS, general manager in Europe for the Western Electric Company, has started back for London, after having spent six weeks in this country, most of which time at the New York City branch and also visiting Hawthorne. Mr. Wilkins has had a tremendous task on his hands since the beginning of the war in August, 1914, and has been conducting the business of the Western Electric Company's allied houses in Europe under conditions that were not thought of several years ago. The closing of the Antwerp factory was one of his most difficult problems, as he found places for the employees in various other units of the company's organization.

Obituary.

C. O. SMITH, manager of the Lewis County Light & Telephone Company, of Morton, Wash., was found dead recently at the company's power plant one mile west of Morton.

JULIUS ANDRAE, founder of the business now known as Julius Andrae & Sons Company, electrical jobbers at Milwaukee, Wis., died at his home, 590 Beverly Road, in that city, on Sunday, December 2. Mr. Andrae was born in Meissen, Saxony, in 1829 and attended city schools until 14 years old. In 1854 he came to New York and in 1855 went to Milwaukee and obtained employment with Schumacher & John. During the Civil War he supplied tool boxes for military use and when peace was declared he organized the present business of Julius Andrae & Sons Company, one of the largest electrical jobbing houses in the country. He retired from active management of the business several years ago, but his mind was continually alert in connection with business. He leaves a number of children, and some of his sons are now conducting the business.

Current News

Weekly Record of Construction Activities—Record of Electrical Patents Issued November 20

EASTERN.

BOSTON, MASS.—Edison Electric Illuminating Company, 39 Boylston street, has awarded a contract for the construction of a five-story sub-station on Chauncey street. George H. Macomber Company, 44 Bromfield street, Boston, has the contract for erection.

BOSTON, MASS.—American Woolen Company, Shawmut National Bank Building, has awarded a contract to the E. W. Pitman Company, Bay State Building, Lawrence, Mass., for the construction of a power house at its plant at Oakland, Me., at a cost of approximately $75,000.

FALL RIVER, MASS.—Fall River Electric Light Company, North Main street, has awarded a contract for the construction of a one-story and basement electric sub-station, about 30x80 feet, to be erected on Hathaway street, at a cost of about $20,000. Beattie & Cornell, 33 North Quarry street, Fall River, are the contractors.

SOMERVILLE, MASS.—New England Telephone and Telegraph Company, 50 Oliver street, Boston, has had plans prepared for the construction of a two-story brick addition to its local telephone exchange plant, about 40x40 feet.

SPRINGFIELD, MASS. — Springfield Street Railway Company has received permission from the Public Service Commission to issue mortgage bonds for $3,275,000.

SOMERVILLE, MASS. — Springfield Provision Company is making rapid progress in the extension and alteration of its local power house. The Casper Ranger Company, 20 Bond street, Holyoke, is the contractor.

SPRINGFIELD, MASS. — United States Government has awarded a contract to Fred T. Ley & Company, 499 Main street, Springfield, for the erection of an addition at the local armory and the installation of new equipment. The entire work will cost about $90,000.

NEW LONDON, CONN.—United States Government, Bureau of Yards & Docks, has had plans prepared for the construction of a two-story power house and machine shop at its local navy yards to cost about $200,000. F. R. Harris, chief.

ASTORIA, L. I.—Astoria Heat, Light & Power Company, Shore Road, is planning to increase the capacity of its plant at Casina Beach on the East River by the construction of an addition to cost about $25,000.

BROOKLYN, N. Y.—Edison Electric Illuminating Company, 13 Willoughby avenue, has awarded a contract to the General Contracting & Engineering Company, 29 Broadway, New York, for the construction of two new intake tunnels at Sixty-sixth street and First avenue.

BROOKLYN, N. Y.—United States Government Bureau of Yards & Docks, is having plans prepared for the construction of a power plant at the local navy yards. The American Institute of Architecture, 101 Park avenue, New York, is the architect. F. R. Harris, chief.

BUFFALO, N. Y.—Kellogg Products Company, 98 Delaware avenue, has had plans prepared for the construction of a two-story transformer house about 32x64 feet, and two-story power house, about 30x112 feet, at 1317 Elk street. Contract has been awarded to B. I. Crooker, 57 Builders' Exchange, Buffalo.

BUFFALO, N. Y.—Delaware, Lackawanna & Western Railroad Company, 90 West street, New York, has awarded a contract to the Durolithic Construction Company, Ellicott Square, Buffalo, for the construction of a one-story power house at its works at East Buffalo.

BUFFALO, N. Y.—Buffalo Union Furnace Company, Katherine street, has had plans prepared for alterations and additions in its power house to cost about $14,000.

BUFFALO, N. Y.—Donner Steel Company, 475 Abbott Road, is planning for the construction of an addition to its power house.

BUFFALO, N. Y.—Bethlehem Steel Corporation has recently completed the erection of a large power house which is to be used for the operation of its new local turbine manufacturing plant. Stone & Webster, Boston, Mass., are the contractors.

CANASERAGA, N. Y.—Canaseraga Heat, Light & Power Company, Inc., has made application to the Public Service Commission for permission to construct and operate a local electric plant.

CENTRAL ISLIP, N. Y.—State Hospital Commission, Albany, has awarded a contract for the construction of its proposed power plant at the local State hospital, at a price of about $150,000. Benjamin Raynor, Locust avenue, Islip, is the contractor.

LOCKPORT, N. Y.—Niagara County Commissioners are planning the construction of an electric light plant on the Old Almshouse site. Frederick H. Krull, clerk.

NEW YORK, N. Y.—The New York Edison Company is having plans prepared for the construction of a new one-story brick addition to its transformer station at Park avenue and One Hundred and Eighty-ninth street, about 40x63 feet. The structure will cost about $15,000. George F. Kiess, 130 East Fifteenth street, New York, is the architect.

WATERTOWN, N. Y.—The Water Board is having preliminary plans prepared for the construction of a large new power plant, about one and one-half miles from the city line, at a cost of $300,000. The S. M. Greene Company, 393 Bridge street, Springfield, Mass., is architect and engineer. J. W. Knowlton is president of the Board

WATERTOWN, N. Y.—Warren J. Green Electrical Company was recently incorporated with Warren J. Greene as its president.

DOVER, N. J.—New Jersey Power & Light Company is making rapid progress in the construction of an addition to its plant, the footings being entirely completed. The addition is to provide for the installation of a new 3500-kilowatt turbo generator, and the structure is expected to be completed and ready for occupancy by Jan. 1.

JERSEY CITY, N. J.—Louisville Traction Company, 15 Exchange Place, has filed notice of the dissolution of the company.

JERSEY CITY, N. J.—Until Dec. 18, Hudson County Park Commission will receive bids for furnishing service for the lighting of Bayonne Park, Bayonne, N. J. Walter G. Muirhead, secretary.

JERSEY CITY, N. J.—Central Railroad of New Jersey, Communipaw avenue, has awarded a contract for the erection of its proposed one-story brick power plant, to cost $150,000. Westinghouse, Church, Kerr & Company, 37 Wall street, New York, are the contractors.

NEWTON, N. J.—Newton Electric & Gas Company is making rapid progress in the installation of a street-lighting system, and it is expected to inaugurate operations within the next two weeks.

WEST ORANGE, N. J.—Edison Storage Battery Company has filed notice of an increase in its capitalization from $3,500,000 to $50,000,000 to provide for expansion, etc.

BENSON, PA.—Borough officials have made application to the Public Service Commission for permission to acquire and operate the plant of the White Oak Electric Company.

CARNEGIE, PA.—Aetna Chemical Company has awarded a contract for the construction of a power house and 100-foot radial brick stack at its works. The W. W. Lindsay Company, Harrison Building, Philadelphia, is the contractor.

CONSHOHOCKEN, PA.—Counties Gas & Electric Company has leased to the John Wood Manufacturing Company a large gas holder at Poplar and Washington streets. Pipe connections will be made from that point to the Wood plant.

LANCASTER, PA.—Fire, on Nov. 23, completely destroyed the power plant of the Lancaster Electric Light, Heat & Power Company, Wabank, with loss estimated at approximately $150,000. G. Searing Wilson, Philadelphia, is president.

PITTSBURGH, PA. — Miller-Owan Electric Company, 217-19 First avenue, has had plans prepared for the erection of a one-story addition to its plant, about 40x200 feet, to cost about $40,000. C. D. Cooley Company, Century Building, Pittsburgh, is architect.

PITTSBURGH, PA.—Council adopted the ordinance to authorize a contract with the Duquesne Light Company to furnish electric light to the first 20 wards of the city for 10 years.

READING, PA.—Metropolitan Edison Company is making rapid progress on the work of increasing the capacity of its transmission lines to Boyertown, a distance of about 20 miles. The lines are being re-insulated and when completed, will have a carrying capacity of 66,000 volts. The company is now building a line to connect with the plant of the Pennsylvania Utilities Company, Easton.

SHAMOKIN, PA.—City has inaugurated operations in its new street-lighting system in the business section of the city, the installation of which has just been completed.

ANNAPOLIS, MD.—United States Government is having final plans prepared for the erection of a high-power radio station at Greenberry Point, just across the Severn River. Right of way for a pole line over the county roads has been secured from the Anne Arundel County Commissioners. The line, which will carry 6600 volts, will run to the plant of the Washington, Baltimore and Annapolis Electric Railways Company, Annapolis, which company will supply the new station with electric power. Estimated cost of the entire work is about $1,000,000.

BALTIMORE, MD.—United Railways & Electric Company is planning for the extension of its electric railway system from the Curtis Bay line at Stonehouse Cove, to East Brooklyn, Fairfield, and Masonville, near Baltimore, to provide accommodations for the employes at the large manufacturing plants at these points.

HAGERSTOWN, MD.—Hagerstown & Frederick Railway Company officially took over the Chambersburg, Greencastle & Waynesboro Railway Company, of Waynesboro, Pa., on Nov. 28, at the office of the latter company.

CAMERON, W. VA.—At a meeting of council it acted favorably on a franchise, granting W. V. Smith the privilege of erecting, operating and maintaining an electric lighting plant here.

CHARLESTON, W. VA.—E. I. Du Pont Powder Company is planning the construction of an enormous plant for the manufacture of munitions at Sattes, where a town for workmen will also be built, and a large amount of electrical work is involved. The Charleston-Dunbar Traction Company will also extend its lines to the town.

CLUTE, W. VA.—Hawley Coal Company is planning for the construction of a power plant at its works. W. I. Hawley, Bluefield, is president.

PEYTONA, W. VA.—Laurel Branch Coal Company, recently incorporated with a capital of $50,000, is planning for the installation of power plant equipment at its works.

ST. MARYS, W. VA.—St. Marys Light & Power Company has had plans prepared for the construction of a one-story electric lighting plant, about 50x 64 feet. R. H. Adair, 501½ Juliana street, Parkersburg, is the architect.

WHEELING, W. VA.—Beech Botton Power Corporation has incorporated to operate in Brooke County. The amount of capital is $400,000, and the incorporators are Allen E. Moore, George F. Jebbett, Alfred F. McCabe, F. H. Butchorn and S. C. T. Dodd.

ATLANTA, GA.—Atlanta & Anderson Railway has been granted permission to issue $18,000,000 of securities for constructing an interurban line from Atlanta to Anderson, S. C.; company proposes to issue $6,000,000 of common and $6,000,000 first-mortgage bonds. J. L. Murphy is president of the company and it is stated that the road will probably be constructed and in operation in two years.

ATLANTA, GA.—Georgia Railway & Power Compay is planning to extend its electric system from the Emory University to the Decatur plant, a distance of about 2 miles.

AUGUSTA, GA.—City, Fire-Alarm & Police Telegraph Committee has awarded a contract for the construction of a new fire-alarm and telegraph station to cost $10,387. The Evans Brothers Construction Company, Augusta, is the contractor.

DECATUR, GA.—City has awarded a contract to the Georgia Railway & Power Company, Atlanta, for the complete electrification of its water works. New electrically-operated triplex pumps and auxiliary equipment will be installed.

NORTH CENTRAL STATES.

CALEDONIA, OHIO.—The town will construct an electric power plant with the proceeds of a bond issue of $10,000, which has just been disposed of.

CANTON, OHIO.—An electric power plant is being installed by the Republic Enameling Company for the purpose of supplying current to its plant. Current has heretofore been secured from the lines of the Central Power Company.

CINCINNATI, OHIO.—The installation of boulevard lights on Central avenue is proposed by the Central Avenue Improvement Association as a means of rehabilitating the thoroughfare. A committee headed by H. J. Levi is in charge of the work of securing this and other improvements designed to give the street a better appearance.

CINCINNATI, OHIO.—Plans for the new $325,000 Stowe school to be erected at Sinton Park have been accepted by the Board of Education. The building is to be of brick and will have 35 rooms. Plans have also been accepted for the new Sherman school at Eighth and John streets. The cost of this will be $250,000. Funds for the new Hoffman school on Walnut Hills will be ready shortly after which arrangements for its construction will be made.

CINCINNATI, OHIO.—Standish Electric Company has incorporated with a capital of $10,000. P. H. Standish and others are the incorporators.

CINCINNATI, OHIO. — Klastowear Manufacturing Company. Capital, $10,000. To manufacture electric specialties. Incorporators: Harry J. Gallagher, Fay McDonald, Carl W. Fledderman, William J. Robb and John M. D. Robb.

DATES AHEAD.

American Institute of Consulting Engineers, Inc. Annual meeting, January 14. Secretary, F. A. Molitor, 35 Nassau Street, New York City.

Electrical Contractors' Association of state of Missouri. Annual convention, January 19. Secretary, A. J. Burns, 318 West Tenth Street, Kansas City, Mo.

Minnesota Electrical Contractors' Association. Annual convention, Minneapolis, Minn., January 20. Secretary, G. M. Jones, 112 South Seventh Street, Minneapolis.

Western Association of Electrical Inspectors. Annual meeting, Memphis, Tenn., January 29-30-31. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, February, 1918. Secretary-Treasurer, L. B. Van Nuys, 238 South Jefferson Avenue, Peoria, Ill.

Vermont Electrical Association. Annual meeting, February, 1918. Secretary-Treasurer, C. H. West, Rutland, Vt.

National Association of Electrical Inspectors. Annual convention, New York, March, 1918. Secretary-Treasurer, William L. Smith, Concord, Mass.

Wisconsin Electrical Association. Annual meeting, March, 1918. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

Southwestern Society of Engineers. Annual meeting, April, 1918. Secretary, C. E. Barglebaugh, 703 First National Bank building, El Paso, Tex.

Kentucky Association of Electrical Contractors. Annual meeting, May, 1918, Louisville, Ky. Secretary, F. F. Balinoti.

Texas State Association of Electrical Contractors. Annual meeting, Galveston, Tex., June, 15, 1918. Secretary, H. S. Ashley, Fort Worth, Tex.

Georgia Electrical Contractors' Association. Annual meeting, June, 1918, Tybee Island, Ga. Secretary, Dan Carey, Atlanta Builders' Exchange, Atlanta, Ga.

CLEVELAND, OHIO.—Ideal Tire & Rubber Company, 385 Guardian Building, has let contract for erecting factory. Boilers and generator equipment is to be purchased, as well as some machinery used in the manufacture of rubber goods.

COLUMBUS, OHIO.—Architect F. L. Packard has plans and will close bids Dec. 22 for the addition to the Chemistry Building for Miami University at Oxford, Ohio. Plans are also on file with Walter L. Tobey, chairman of special building committee, Oxford.

CARTHAGE, ILL.—Central Illinois Public Service Company is asking for a permit from the city to erect poles on high-voltage lines through Carthage in order to connect Augusta, Beardstown and Macomb circuit with a complete circuit, and which would permit getting into the Beardstown district by two routes. E. B. Graham, secretary, 116 South Sixteenth street, Mattoon.

DECATUR, ILL.—Decatur Railway & Light Company has increased its capital from $1,375,000 to $1,600,000.

MONMOUTH, ILL.—Monmouth Acetylene & Electric Company's plant has been destroyed by fire.

SAN JOSE, ILL.—The plant of the San Jose Electric Light & Power Company, owned by Frank Hullinger, was destroyed by fire recently. The loss is estimated at $6000.

URBANA, ILL.—Urbana Light, Heat & Power Company has increased its capital from $150,000 to $200,000.

ALMA, WIS. — Wisconsin-Minnesota Light & Power Company, Eau Claire, has bought the electric lighting plant owned by the Alma Electric Light Company.

EAU CLAIRE, WIS.—Gillette Rubber Company will build a transformer house. R. B. Gillette, manager.

GREEN BAY, WIS.—Plans for an extensive ornamental post lighting system in the business district are being worked out by a special lighting committee of the Green Bay Association of Commerce.

GRESHAM, WIS.—Bond issue of $14,000 for electric lighting plant and waterworks system carried at election.

LADYSMITH, WIS.—Council may buy the electric plant owned by a private company.

STEVENS POINT, WIS.—Work on the new power line between Mosinee and this city will be finished by Jan. 1. This will connect up the water powers of Whiting-Plover and Mead-Witter in the Stevens Point district, and the power of Mosinee, Merrill, Rothschild and Wausau. The line from Mosinee to Stevens Point is 22 miles long and costs about $3000 a mile.

DAVENPORT, IOWA. — Brady Street Merchants' Association is planning ways and means to secure improved lighting.

IOWA CITY, IOWA. — A $15,000 hydraulic experiment station will be erected across the river near the west end of the large dam.

McCAUSLAND, IOWA.—Notice has been issued at a special election to be held Dec. 17 to vote on the granting of rights to William Stutzel, R. D. Anderson and F. E. Ringley to operate an electric lighting system.

OCONTO, NEB.—Election will soon be held to vote bond issue of $3800 for municipal electric lighting plant.

CRARY, N. D.—A franchise has been granted to John W. Ebert for electric lighting plant.

FARGO, N. D.—General Gas-Electric Plant Company has incorporated with a capital of $25,000. The company will install gas and electric plants and manufacture and sell gas and electricity for light and power.

MICHIGAN, N. D.—The new lighting plant has been completed, which replaces the one destroyed by fire June 10. Since that time the city has been furnished power from a small engine attached to a small dynamo.

TIOGA, N. D.—Council is considering bond issue of $6000 for electric lighting system.

SOUTH CENTRAL STATES.

COVINGTON, KY.—Electric pumps may be installed at the city waterworks of Covington, for the purpose of doing the pumping, a saving of $12,000 a year being estimated as the result. The city has no funds available for the purpose, but the Union Light, Heat & Power Company, which supplies current to Covington, has offered to install the pumps and accept payment in installments.

MAYSVILLE, KY.—Cochran Brothers have incorporated with a capital of $100,000, to produce electricity at plant now being erected. The stockholders are H. J. Cochran, R. A. Cochran, W. D. Cochran, J. H. Cochran and Judge A. M. J. Cochran.

SHELBYVILLE, KY.—Frankfort & Shelbyville Electric Company, recently incorporated with a capital of $500,000, is planning for the immediate construction of an electric interurban railway from Shelbyville to Frankfort, a distance of about 19½ miles. P. C. Phillips, Philadelphia, is president. Offices of the company are located in the Louisville Trust Building, Louisville.

WHITESBURG, KY.—W. C. Daniels & Sons will make extensions and improvements in electric light plant at an expenditure of several thousand dollars.

COAL CREEK, TENN.—Black Diamond Coal Company, Knoxville, is planning for the immediate installation of a new alternating current power plant at its local works.

BIRMINGHAM, ALA. — Prices are wanted on 350 to 400-kilovolt amperes, 2300-volt, 3-phase, 60-cycle generator, direct-connected to cross compound engine, complete with exciter and switchboard. Time of delivery is requested. Howard H. Gassman, Brown-Marx Building, this city, is the consulting engineer.

GADSDEN, ALA.—Davis-Alcott Hosiery Mills is planning for the immediate installation of electric motors, shafting, etc., at its works.

HUNTSVILLE, ALA. — Huntsville Gas, Light & Fuel Company's plant has been acquired by Lawrence Cooper and

associates, who will organize a company and improve the plant.

EARLE, ARK.—Arkmo Lumber Company will spend $6500 in improvements. The plant will be equipped with latest machinery and run with electric power.

TULSA, OKLA.—Domestic Electric Lighting Company has incorporated with a capital of $5000. Address A. B. Evans, 206 Gillette Building.

ABILENE, TEX.—George W. Williamson, of Chicago, is the principal stockholder in the West Texas Utilities Company, this city, with capital of $400,000 and the East Texas Utilities Company, of Marshall, with capital of $300,000, companies just organized. The West Texas Utilities Company has taken over the properties of the Abilene Gas & Electric Company, here, the Baird Gas & Electric Company, of Baird, and the Hamlin Gas & Electric Company, of Hamlin, Tex. The East Texas Utilities Company has acquired the holdings of the Marshall Electric Company, the Marshall Traction Company and the Marshall Ice Company; the Jefferson Ice & Light Company, of Jefferson, Tex., and the Longview Ice & Light Company, Longview, Tex. Associated with Mr. Williamson as incorporators of these two companies are J. M. Dickie, J. F. Meadows and F. A. Matthes, all of Abilene; A. Hargrave and Sidney G. Vigo, of Dallas. It is said that the several plants will be enlarged and considerable new machinery will be installed.

AMARILLO, TEX.—City commission has under consideration plans for the construction of a municipal electric light plant here. The proposition of voting $200,000 bonds for the purpose will probably be submitted to the taxpayers soon.

DALLAS, TEX.—City commission has authorized the Dallas Power & Light Company to borrow $4,000,000 and to issue 18,500 shares of stock with a par value of $100 each. It is stated that 6 per cent notes will be issued for the loan.

DALLAS, TEX.—Dallas Power & Light Company has completed its budget providing for improvements and extensions in its system for the next five years, and an expenditure of about $2,834,500 is involved, including the following: Improvements and extensions in its underground conduit system, about $918,200; improvements in its overhead system, $253,600; construction of three new substations, $577,400, $575,000, and $181,300, respectively; and improvements and extensions in its generating and transmission systems, $729,000.

FORT WORTH, TEX.—Fort Worth Power & Light Company has increased its capital stock from $3,860,000 to $4,360,000. The company is adding an additional building, to care for its increased business.

WESTERN STATES.

GREAT FALLS, MONT.—Montana Power Company will erect a two-story and basement 90x116 foot building at a cost of about $65,000.

HARLEM, MONT.—Bid of electric construction company for ornamental lighting system accepted at $4340.

KALISPELL, MONT.—Resolution has been passed creating a lighting district in Kalispel.

KALISPELL, MONT.—The property here of the Northern Idaho & Montana Power Company, including the Big Fork power plant, telephone and power lines and real estate were sold recently at public auction to Robert J. Graf for $563,166. The Northern Idaho Company, a Bylesby concern, was put into the hands of a receiver last January.

MISSOULA, MONT.—Plans have been decided upon for installing lighting system for State University campus, which provides for 400 candlepower lamps on iron brackets on driveway. F. C. Scheuch, president.

BISBEE, ARIZ.—City Council election will be held to vote on $375,000 bond issue to build electric-lighting system and gas manufacturing plants; also a water system.

YUMA, ARIZ.—Plans for voting $200,000 bonds, the proceeds to be used in the construction of municipal electric light and water works plants here have been blocked by the refusal of Mayor George Michalson refusing to sign the ordinance calling the election.

PRICE, UTAH.—City Council has called an election for Dec. 22 for taxpayers to vote on leasing the municipal lighting plant. The plant is bonded for $25,000, but there is no way at present by which the city can pay the bonds. J. H. Manson, who has managed it for two or three years, has made a proposition to lease the plant for 25 years, pay off the bonds, furnish the city with free lights for streets and public buildings, make all needed extensions and turn the plant back to the city at the expiration of the lease in first-class condition and free from indebtedness.

RENO, NEV.—Construction of a power line, 15 miles long, to carry current from the end of the Great Western Company's Indian Valley line to the Walker Mines Company, near Portola, Cal., has been completed. Transformers are being tested and it is expected that current will displace steam plants in milling operations and part of the mining.

ALBION, IDA.—Secretary of the Interior has authorized the reclamation service to execute a contract with A. M. Ohl, of this place, for construction of about nine miles of electric transmission line in connection with the Minidoka Irrigation Project at the contract price of $6,245.

FORT FLAGLER, WASH.—Government has awarded to the Arrow Electric Company, of Seattle, the contract for installing all the electric wiring, transformers, sheet lighting systems, etc., for the cantonments at Forts Flagler, Casey and Worden. About 40 buildings will be erected.

NEWPORT, WASH. — George E. Worthington, Spokane special master, recently sold the properties of the Northern Idaho & Montana Power Company, including those here, at Sandpoint, Idaho, and of the Oregon Power Company at Eugene, Ore. Property was bid in by John H. Roemer, 208 South LaSalle Street, Chicago, representing the reorganized companies, at $5,016,773.

PROSSER, WASH.—It was decided to accept recommendation of special light committee and sign a contract with the Pacific Power & Light Company to have arc lights replaced by incandescent lamps.

SEATTLE, WASH.—City has sold to John E. Price & Company light extension bonds to the amount of $90,000.

SEATTLE, WASH.—Following estimates have been made on four possible plans for the installation of a municipal electric power plant on Cedar River for this city by J. L. Stannard, an engineer employed for the purpose: Plan A, with a 9.4-mile transmission line, $2,390,630; Plan B, with an 11.2-mile transmission line, $2,563,950; Plan C, with a 9-mile transmission line, $2,242,300; and Plan D, with an 8.5-mile transmission line, $1,919,300. Plan A would supply 8000 kilowatts at $298; Plan B, 8000 kilowatts at $320; Plan C, 7000 kilowatts at $320, and Plan D, 7000 kilowatts at $274.

SHELTON, WASH.—Shelton Light & Power Company has applied to the commissioners for a franchise for a term of years to construct and operate transmission lines from plant at Goldsborough Creek over country roads. Hearing was held Dec. 5.

TACOMA, WASH.—City council has voted to extend the present municipal car line on the tide flats for about one mile at a cost of $18,000.

TACOMA, WASH.—Tacoma Railway & Power Company will extend its line into Camp Lewis to help in relieving the traffic problem.

VANCOUVER, WASH.—Northwestern Electric Company has secured a 50-year franchise for using all the county roads and streets outside of incorporated cities and towns in different portions of the county. The company intends to supply current for lights and power to the farmers in that district and to industries this side of Camas, as well as some already in the prescribed district.

ROSSLAND, B. C., CANADA.—Preliminary work has begun on the high power line of the West Kootenai Power Company from Rossland to Cooper mountain near Princeton. Main line extension will be about 180 miles long. It is reported that the cost of the new line with laterals and substations will be from $2,000,000 to $2,500,000.

ASTORIA, ORE.—Matter of extending the street car line to the McEachern Ship Company yards, and to the plant of the Astoria Pulp & Paper Company at a cost of about $20,000 is being considered.

ASTORIA, ORE.—Pacific Power & Light Company has asked the city for permission to erect a small substation on Taylor avenue.

BEND, ORE.—Deschutes White Pine Lumber Company proposes to start an 80,000 to 100,000-foot capacity sawmill at Pringle Falls this winter, machinery to be installed in the spring. It is estimated that 2250 horsepower will be generated to start the mill in operation, and the entire river will be diverted later through a 1000-foot canal with an eight-foot fall at the end.

PENDLETON, ORE.—Pacific Power & Light Company has been granted a 50-year franchise for operating in the town of Helix. Power and light are to be installed as soon as possible.

SAN DIEGO, CAL.—San Diego South Eastern Railway is planning the erection of an electric railway into Mountain Empire from Lakeside to Santa Ysabel, about 27 miles distance. E. J. Burns, San Diego, manager.

PORTLAND, ORE.—It is reported that the Southern Pacific Railroad Company may electrify its line over the Siskiyou mountains in northern California.

WENDLING, ORE.—Plans for the immediate erection of a large planing mill here and the gradual electrification of the Wendling plant of the Booth-Kelly Lumber Company are under way.

COPPEROPOLIS, CAL.—Sierra & San Francisco Power Company's substation here was destroyed by fire recently, caused by the explosion of an overloaded transformer. The loss is estimated at $65,000.

ESCONDIDO, CAL.—San Diego Consolidated Gas & Electric Company is completing plans for the building of a three-phase electric transmission line into San Pasqual Valley within the next two months.

HANFORD, CAL.—Peoples Ditch Company will install an electric light and power plant at the headgate of its irrigation system.

LOS ANGELES, CAL.—Coachella Power & Irrigation Canal, through F. M. Merrill and W. B. Baker, of this city, has filed application with the State Water Commission to install an irrigation system in the Morengo Valley, San Bernardino County, to cost $4,900,000. The company plans to irrigate 25,000 acres and to generate 30,000 horsepower, hydroelectric energy, from two power plants above the Whitewater River Valley, to which the waters will be led for irrigation purposes in 65 miles of canals and pipe lines. Morengo Valley will be utilized as a storage reservoir with a capacity of 150,000 acre feet.

LOS ANGELES, CAL.—Pacific Electric Railway, Pacific Electric Building, plans to build an extension from Santa Ana to San Diego. J. McMillan, general manager.

LOS ANGELES, CAL.—Hammond Electric Protection Company has been incorporated here with a capital stock of $250,000, by W. D. Hammond, C. E. Rees, W. I. Gilbert, E. C. Mason and B. N. Hammond.

REDDING, CAL.—William A. McEwan of this city has been granted a permit to use for electric power purposes 25 second feet of the waters of Boulder Creek and Little Boulder Creek in Trinity County, Cal.

SAN DIEGO, CAL.—Electric Supply Company has been incorporated here by C. H. Hall, R. H. Hall, R. J. Zink and E. V. Winnek.

SAN DIEGO, CAL.—La Jolla Beach Railway line is to be converted into an electric line.

SAN DIEGO, CAL.—San Diego Consolidated Gas & Electric Company has filed with the California State Railroad Commission an application for authority to issue bonds to the amount of $165,000.

SAN FRANCISCO, CAL.—California Telephone & Light Company has made application for permission to extend its transmission system in order to serve Summer Home Park and vicinity in Sonoma County.

SAN FRANCISCO, CAL.—Gas & Electric Sales Company has been incorporated here with a capital stock of $40,000. The subscribers and directors are: Thomas Steel, Berkeley, Cal.; M. J. Purcell, V. A. Kuehn, Lee M. Olds and A. C. Duerr, of San Francisco.

INCORPORATIONS

ASHDOWN, ARK.—Ashdown Light & Ice Company. Capital, $50,000. Incorporators: M. B. and S. R. Morgan, and J. D. Tatum.

DOVER, DEL.—Montgomery Transit & Light Company. Capital $1,000,000. To construct and operate railways and light plants. Incorporators: John J. Jolls, M. L. Horty, and K. E. Longfield, Wilmington.

DOVER, DEL.—Motorless Sign Flasher Company. Capital, $300,000. To manufacture electric machines, storage batteries, etc. Incorporators: S. A. Williams, A. M. Halloran, and Ferril Giles, Wilmington.

WILMINGTON, DEL.—E. R. Kibler Company. Capital, $200,000. To engage as electrical and mechanical engineers. Incorporators: C. L. Rimlinger, M. M. Clancy, and C. M. Egner, Wilmington.

BALTIMORE, MD. — The Standard Electric & Elevator Company. Capital, $500,000. To manufacture electric elevators. Incorporators: C. A. Yarrington, Frank Stark, and C. B. Roberts, 118 West Pratt street, Baltimore.

FLINT, MICH.—Auto Supply & Electric Service Station. Capital, $10,000.

FLINT, MICH.—M. & S. Electric Company. Capital, $50,000.

BAYONNE, N. J.—Jandous Electric Equipment Company. Capital, $10,000. To engage in a general electric contracting business. Incorporators: L. and B. Freed, and G. Silverman, all of New York.

CAMDEN, N. J.—Liberty Transit Company. Capital, $10,000. Incorporators: T. C. Smith and W. S. Gano, Drexel Hill, Pa.; and M. E. Hatch, Philadelphia, Pa.

CARTARET, N. J.—Nelson Electrolytic Cell Company. Capital, $250,000. To manufacture electric cells, batteries, etc. Incorporators: Hamilton M. Dawes, S. Aplert, and Otto J. Wagner, New York.

GARWOOD, N. J.—Aircraft Specialties Company. Capital, $25,000. To manufacture electric motors. Incorporators: William Siebenmorgan, William B. Elliott, and George A. Elliott, Garwood.

NEW BRUNSWICK, N. J.—L. Adler & Company. Capital, $25,000. To manufacture electrical fixtures. Incorporators: Robert Rosen and Louis P. Ruck, New Brunswick, and L. and A. Adler, Bound Brook.

NEW YORK, N. Y.—Elliott Rappaport, Inc. Capital, $10,000. To engage in a general electrical and mechanical engineering business. Incorporators: S. Elliott, A. J. Rosenthal, and A. Rappaport, 200 West Twenty-first street.

NEW YORK, N. Y.—Edison Electric Appliance Company. Capital, $2,650,000. To manufacture electric appliances. Incorporators: H. C. Houck, C. E. Patterson, and A. H. Jackson, Schenectady.

NEW YORK, N. Y.—New York Rotary Motor Company. Capital, $1,700,000. To manufacture motors, etc. Incorporators: A. M. Sullivan, and H. and S. S. Meyers, 60 Wall street.

NEW YORK, N. Y.—Brenner Gas & Byproducts Corporation. Capital, $100,000. To engage as electrical and mechanical engineers. Incorporators: Samuel B. Howard, George V. Reilly, and Arthur W. Britton, 65 Cedar street.

NEW YORK, N. Y.—Firth & Marshall. Capital, $100,000. To manufacture electrical and wireless appliances. Incorporators: C. Marshall, J. Firth, and H. Freece, 35 Wall street.

NEW YORK, N. Y. — Hamilton & Hansell, Inc. Capital, $100,000. To engage as electrical engineers. Incorporators: J. G. Waldron, R. S. O'Connell, and R. Elliott, 26 Park Row.

NEW YORK, N. Y.—Empire Electric Steel Corporation. Capital, $500,000. Incorporators: E. H. Rapp, Eric Pusinelli, and George R. Hamilton, 2 Rector street.

CHARLOTTE, N. C.—Smith Novotoy Electric Company. Capital, $10,000. To manufacture electrical novelties of various kinds. Incorporators: E. H. Isenhour, S. J. Smith, and A. B. Justice.

ST. PAULS, N. C.—Erwaldson Manufacturing Company. Capital, $25,000. To manufacture electrical supplies. Incorporators: W. D. Johnson, A. R. McEachern, and G. T. Fisher.

CANTON, OHIO.—Edison Electric Company. Capital, $10,000. Guy L. Tudor, H. L. Slagle, V. P. Messe, G. F. Koehler and G. M. Montgomery.

BRADFORD, PA.—Bradford Township, Foster Township, Keating Township, Lafayette Township, Port Allegany and Smethport Power Companies. Nominal capital, each $5,000. Milwood Oliver, treasurer.

LANCASTER, PA.—Farmers Electric Companies of Conestoga, Pequea, and Martie. Capital of each, $5000. Incorporators: John H. Ware, Jr., C. M. Ware, and W. E. Edwards.

TAYLORS, S. C.—Taylors Telephone Company. Capital, $100,000. Incorporators: J. F. Freeman, W. Y. McDaniel, and I. W. Garrett.

NORFOLK, VA. — Economy Electric Company. Capital, $50,000. To manufacture electrical supplies. Incorporators: Charles A. Page and E. R. Page.

CLAY, W. VA.—Clay Citizens Telephone Company. Nominal capital, $5000. Incorporators: B. C. Eakel, W. S. Pierson and P. M. Summers.

PINEVILLE, W. VA.—Wyoming Telephone Company. Capital, $10,000. The company will operate in Wyoming. Incorporators: Guy White and H. W. Whitehead.

PROPOSALS

ELECTRIC FIXTURES. — Sealed proposals will be received by the County Commissioners of Champaign County December 12 for furnishing electric fixtures for the Champaign County Courthouse and jail at Urbana, Ohio. Bids must be in accordance with the drawings and specifications prepared by A. C. and E. A. Weber, architects, Citizens Bank Building, Urbana.

LIGHTING FIXTURES.—Sealed proposals for the installation of lighting fixtures in the new courthouse and jail under construction in Cincinnati, Ohio, will be received by the Courthouse Building Commission until 12 m. December 18. Drawings and specifications covering the work are in the office of Rankin, Kellogg & Crane, architects, 1012 Walnut Street, Philadelphia, with the commission, and with the auditor of Hamilton County in Cincinnati.

ELECTRICAL EQUIPMENT. — Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids on the following equipment: 2,000 feet single-conductor copper cable, schedule 1591, 15,000 feet incandescent lamp cord, schedule 1591, 1,500 feet 2-conductor electric wire, schedule 1592, 62,000 feet lighting and power wire, schedule 1593, 6,000 feet lighting and power wire, schedule 1591, miscellaneous quantity single-conductor lighting and power wire and 550 pounds magnet wire, schedule 1593, 20 pounds nickel chromium resistance wire, schedule 1593, 400 feet 3-conductor rubber-covered wire, schedule 1591, all for delivery at Puget Sound, Wash.; 400,000 feet ship lighting cable, schedule 1591, 70,000 feet fire-control telephone cord, schedule 1593, motor generator sets, schedule 1598, 750,000 feet silicon bronze antenna wire, schedule 1592, 12,000 feet high-tension wire, schedule 1593, 225,500 feet single rubber-insulated, lead-covered wire, schedule 1591, 350,000 feet rubber-covered duplex wire, schedule 1591, 250,000 feet single-conductor plain wire, schedule 1593, 45,000 feet single-conductor plain wire, schedule 1593, all for delivery at Brooklyn, N. Y.; 27,500 feet inter-communication cable, schedule 1593, and miscellaneous dry cells, schedule 1604, for delivery at various points; 60,000 feet leaded and armored wire, schedule 1593, 50,000 feet double-conductor portable wire, schedule 1593, and 20,000 feet 2-conductor wire, schedule 1593 all for delivery at New Orleans, La.

Electrical Patents Issued November 20, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,246,831. **Brake.** F. W. Adsit, Chicago, Ill. Electromagnet device for automobile wheel, associated with clutch lever.

1,246,845. **Electric Circuit-Making Device.** R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Structure of attachment plug.

1,246,846. **Electrical Receptacle.** R. B. Benjamin, assignor to Benjamin Electric Mfg. Co. Structural details.

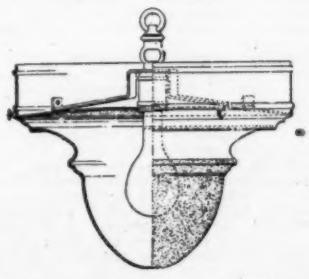
1,246,847. **Electric Sign.** P. J. Berg, Chicago, Ill. Comprises colored lamp tubes for interior illumination and daylight display.

1,246,852. **Electric Apparatus.** J. Bijur, assignor to Bijur Motor Lighting Co., New York, N. Y. Combined generating and regulating apparatus for automobile circuits.

1,246,853. **Taper-Charge Current-Regulator.** W. L. Bliss, assignor to U. S. Light & Heat Corp., Niagara Falls, N. Y. Relates to the regulation of a shunt-wound generator in a car-lighting system.

1,246,854. **Stop-Charge Current-Regulator.** W. L. Bliss, assignor to U. S. Light & Heat Corp. System of generation and regulation for a car-lighting system.

1,246,855. **Battery-Charging System.** W. L. Bliss, assignor to U. S. Light & Heat Corp. Resistance regulation in a car-lighting system.



No. 1,247,000—Lighting Fixture.

1,246,876. **Battery-Capping Machine.** S. L. Casella, assignor to C. Hubert, White Plains, N. Y. For applying caps to cells.

1,246,881. **Telephone-Exchange System.** H. P. Clausen, assignor to Western Electric Co., New York, N. Y. Relates to grouping of lines in an automatic system.

1,246,882. **Telephone System.** H. P. Clausen, assignor to Western Electric Co. Modification of above.

1,246,890. **Spark Plug.** J. A. De Vilbiss, assignor to H. L. Boudreau, St. Louis, Mo. Details of construction.

1,246,894. **Elevator-Control Lock.** E. L. Dunn, assignor to Standard Plunger Elevator Co., Worcester, Mass. Arrangement for interlocking the motor controller with the elevator door.

1,246,895. **Phonograph Transmitter.** H. C. Egerton, assignor to Western Electric Co. Structure of stylus-operated microphone.

1,246,927. **Thermoelectric Regulator.** L. P. Hynes, assignor to Thermo Electric Regulator Co., Chicago, Ill. Details of thermostatically controlled device.

1,246,964. **Electric Cable.** C. W. Lowe, assignor to Western Electric Co. Details of armor-engaging coupling for cables.

1,246,966. **Spark Plug.** A. E. McDaniel, assignor one-half to V. Nees, Cedar Rapids, Iowa. Self-cleaning device.

1,246,967. **Ceiling Fan.** W. M. McEwen, Chicago, Ill. Structure and mounting of motor and fan.

1,246,970. **Connection Sleeve for Cables.** J. T. Madigan, Colorado Springs, Colo. For connecting the end portions of inclosing tube of wire cables.

1,246,973. Transformer for High-Frequency Currents. G. Marconi and W. S. Entwistle, assignors to Marconi Wireless Telegraph Co. of America, New York, N. Y. For wireless; the primary has a split-ring core of laminated non-magnetic material and a layer of helically disposed stranded conductors.

1,247,000. Lighting Fixture. H. Plaut, New York, N. Y. Lamp-inclosing structure for suspension from the ceiling. (See cut.)

1,247,009. Rheostat. T. Rhodus, Chicago, Ill. An annular arrangement of helices of wires of different sections is contacted internally by a rotary member.

1,247,012. Spark Plug. A. L. Riggs, Ebensburg, Pa. Details of construction.

1,247,022. Battery. F. B. Smith, Malden, Mass. Arrangement of contacts and resistance in a casing for dry cells.

1,247,026. Incandescent-Lamp Socket. M. V. Smith, assignor to J. E. Hamilton, Simsbury, Conn. Structural details.

1,247,041. Automatic Cutout Switch. E. Waigand and B. Waigand, Nampa, Idaho. Details of structure biased to open and held closed by a fuse.

1,247,042. Supporting Frame for Electric Switches. C. M. Walker, Pueblo, Colo., assignor to Miller Electric Switch Co. Structure of box and holding frame for solenoid-operated switch.

1,247,049. Spark Plug. W. Willett, East Orange, N. J. Structural details.

1,247,068. Filament. B. L. Benbow, assignor to General Electric Co. For incandescent lamps; is in the shape of a helix, the turns of which are made of helices.

1,247,102. Spark Plug for Internal-Combustion Engines. K. Forbes, Flint, Mich. Details of construction.

1,247,120. Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. A system adapted to transmit simultaneously two messages from one terminal of the line.

1,247,122 and 1,247,123. Plate-Guard for Secondary Batteries. J. O. Luthy, San Antonio, Tex. Structures of sheaths or envelopes for the plate.

1,247,125. Armored Conductor. C. P. Madsen, Chicago, Ill. Structure of heating unit.

1,247,127. Protection of Transmission Systems. R. H. Marvin, assignor to General Electric Co. Means for automatically connecting a faulty phase, only, with ground.

1,247,138. Starting Mechanism for Automobiles. W. G. Mylius, assignor to Westinghouse Electric & Mfg. Co. Motor gearing.

1,247,179. Electrodeposition and Extraction of Zinc. U. C. Tainton, London, and J. N. Pring, Chester, England. For extracting metallic zinc from its salts.

1,247,180. Electric-Switch Guard. S. S. Thompson and E. J. LeBlond, Minneapolis, Minn. The line switch and fuse block of a service box are covered by a separate casing within the service box, which is locked in place.

1,247,197. Automatic Telephone System. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Structure and connections of selector switch.

1,247,210. Electric Heater. H. A. Black, Topeka, Kans. Structure of resistance unit.

1,247,234. Receiver-Supporting Attachment for Desk-Telephone Transmitters. C. O. Dewey, Brookline, Mass. A balanced arm for attachment to a portable insulator.

1,247,286. Electrical Heating Unit. F. Kuhn and J. A. Hand, assignors to American Electrical Heater Co., Detroit, Mich. Has special sheet-metal resistor support.

1,247,287. Sheet-Metal Construction. M. Lachman, assignor to Universal Electric Welding Co., New York, N. Y. Special spot-welded structure.

1,247,297. Electric Machine. F. G. Liljenroth Westeras, Sweden. Commutator structure.

1,247,317. Liquid Gauge. T. Nakamigawa, New York, N. Y. For electrically indicating liquid level at a convenient point on an automobile, in a receptacle at another point of the vehicle.

1,247,343. Condenser-Type Suspension Insulator. S. S. Sonneborn, Brooklyn, N. Y. Details of high-potential structure.

1,247,345. Spark Plug. M. Standish, Omaha, Nebr. Structural details.

1,247,346. Electric Battery-Lamp. J. Stern, Amityville, N. Y. Construction of flashlight.

1,247,353. Telephone-Exchange System. H. G. Webster, assignor to J. R. Garfield, Cleveland, O. Details of automatic switching mechanism.

1,247,357. Push-Button for Steering Posts. M. S. Young, Detroit, Mich. For controlling horn circuits.

1,247,358. Reeling Device. J. Zwilling, assignor to Western Electric Co. For reeling and connecting conductors.

1,247,362. Extracting Tool. J. Bell, West Medway, Mass. For removing lamp bulbs from their sockets.

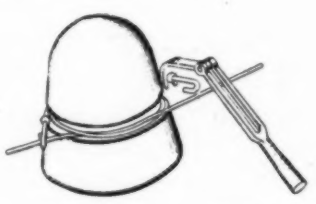
1,247,371. Telephone-Exchange System. W. W. Carpenter, assignor to Western Electric Co. Arrangement of an impulse-counting device for sending in automatic systems.

1,247,392. Telephone Cord. H. H. Glenn, assignor to Western Electric Co. Is composed of a group of tinsel threads stranded together, each composed of a metal ribbon helically applied to a central core with a definite overlap.

1,247,395. Automatic Telephone System. C. L. Goodrum, assignor to Western Electric Co. Structure of automatic switching mechanism.

1,247,399. Solenoid-Operated Switch. C. J. Hendrickson, assignor to Western Electric Co. Automatic structure for use in telephone exchanges.

1,247,418. Electric Locomotive. N. D. Levin, assignor to Jeffrey Mfg. Co., Columbus, O. Mounting of motor and cable reel on a mining locomotive.



No. 1,247,531—Insulator.

1,247,419. Mining Machine. N. D. Levin, assignor to Jeffrey Mfg. Co. Electric coal-cutting machine.

1,247,421. Electric Locomotive Cable-Reeling Mechanism. N. D. Levin, assignor to Jeffrey Mfg. Co. Details of conductor reel.

1,247,436. Controller. R. H. McLain, assignor to General Electric Co. Arrangement of electromagnetic switches and master switch for controlling a motor.

1,247,444. Mining Apparatus. G. B. Norris, assignor to Jeffrey Mfg. Co. Relates to cable reel and connection for serving motor.

1,247,445. Lighting Fixture. H. Northwood, Wheeling, W. Va. Details of light-diffusion bowl and shield for socket attachment.

1,247,446. Controller. C. L. Perry, assignor to General Electric Co. Modification of No. 1,247,436.

1,247,454. Draftsman's Lamp. R. L. Rizer, Cumberland, Md. Relates to adjustable mounting and reflectors for incandescent lamps.

1,247,468. Electric Switch. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. Structure of three-point device.

1,247,477. Signal-Controlling Means for Railway Crossing. H. J. Yager, Seattle, Wash. Details of frog-operated contacts for controlling signal circuit.

1,247,488. Electric Fly Trap. W. A. Bass, Rio Vista, Tex. Arrangement of insulated charged wires to form a cage.

1,247,492. Lamp-Socket Casing. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Relates to snap fastening between the shell and cap.

1,247,493. Shade-Holder. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co. For connecting a shade to a beaded lamp socket.

1,247,531. Support for Line Wires. V. Head, Alexander, Tex. Manner of tying a line wire to an insulator. (See cut.)

1,247,546. Railway-Controlling Apparatus. F. T. Knight, Columbus, Ga. Details of electromagnetically operated valve.

1,247,555. Fuse Puller. E. H. Lowe, Modesto, Cal. A fuse plug is adapted to receive the threaded end of an ordinary insulator pin which may be employed to remove or insert the plug.

1,247,556. Apparatus for the Production of High-Frequency Currents of Electricity. D. G. McCaa, Lancaster, Pa. For wireless; arrangements for operating from two-phase source.

1,247,565. Photographic-Printing Machine. F. W. Norton, Cedar Rapids, Iowa. Arrangement of light chamber and platten with mechanism for operating the latter.

1,247,582. Headlamp Control. O. R. Sell, Colorado Springs, Colo. Arrangement of a reflector and adjustable lamp support.

Patents Expired.

The following United States electrical patents expired on December 4, 1917:

662,911. Electrical Heater. J. E. Brown, Philadelphia, Pa.

662,913. Elevator. J. Bush, London, England.

662,921. Apparatus for Electric Traction. H. Dolter, Paris, France.

662,928. Space Block for Armatures. H. Geisenhoner, Schenectady, N. Y.

662,931. Electric Arc Lamp. F. A. Gilbert, Brookline, and E. O. Lundin, Beachmont, Mass.

662,979. Automatic Magnetic Circuit-Breaker. W. M. Scott, Philadelphia, Pa.

662,984. Telephone Exchange System. A. Stromberg, Chicago, Ill.

662,985. Telephone Transmitter. A. Stromberg, Chicago, Ill.

662,986. Telephone-exchange System and Apparatus. A. Stromberg, Chicago, Ill.

662,987. Circuit Protector. A. Stromberg, Chicago, Ill.

662,988. Telephone-exchange System. A. Stromberg and W. M. Davis, Chicago, Ill.

662,992. Electric-current Indicator. H. M. Warren, Schenectady, N. Y.

662,995. Electric Arc Lamp. O. N. Wiswell, Lynn, Mass.

662,996. Electric Arc Lamp. J. J. Wood, Ft. Wayne, Ind.

663,015. Electric Meter. T. A. Edison, Llewellyn Park, N. J.

663,039. Flush-switch Support. C. G. Perkins, Hartford, Conn.

663,043. Return Signal Device for Call Boxes. J. S. Robinson and H. M. Robinson, Chicago, Ill.

663,059. Automatic Electrical Apparatus for Indicating Leaks in Ships. W. W. Zvorikin and S. de Blumenthal, Moscow Russia.

663,082. Fire-alarm Telegraph Apparatus. W. H. Kirnan, Bayonne, N. J.

663,095. Incandescent Body for Electric Glow Lamps. A. Just, Vienna, Austria-Hungary.

663,130. Electrical Apparatus for Controlling Signal or Other Circuits. H. A. Parrish, Jackson, Mich.

663,196. Telephone Receiver. C. H. North, Cleveland, O.

663,198. Clip or Support for Trolley Wires. W. H. Russell, Watertown, Mass.

663,207. Means for Starting or Stopping Electric Motors. J. J. Wood, Ft. Wayne, Ind.

663,209. Knife Switch. J. A. Wright, Irwin, Pa.

663,216. Railway Telephone System. E. E. Carpenter, Worcester, Mass.

663,217. Ceiling Cut-out. W. A. Church, Pittsburgh, Pa.

663,232. Switch Box for Electric Railways. W. Kingsland, London, England.

663,233. Connection of Strikers to Motor Vehicles for Mechanically Operating Electric Switches. W. Kingsland, London, England.

663,289. Dry Battery. E. Meyer, Paris, France.

663,304. Magnetic Separator. F. Theilengerdes, Memphis, Tenn.

663,346. Electric Arc Lamp. W. C. Johnson and A. Wunderlich, London, England.

663,360. Electrical Rail Bond. W. Pervenko, Kiew, Russia.

663,367. Switchboard for Telephonic or Telegraphic Purposes. C. Shore, Bolton, and C. Heap, Caldershaw Rochdale, England.

663,376. Electrical Railway-signaling System. L. C. Werner, Louisville, Ky.

663,388. Electric Igniter for Explosive Engines. M. S. Napier, London, England.

663,398. Electric Railway. E. Sussmann-Hellborn and W. Hornauer, Munich, Germany.

663,400. Method of Controlling Mechanism by Means of Electric or Electromagnetic Waves of High Frequency. E. Wilson and C. J. Evans, London, England.

Financial News

COPPER.

National Conduit & Cable Company, Inc., and National Brass & Copper Tube Company, Inc., New York City, manufacturers of bare copper wire, weatherproof wires and cables, etc., have jointly issued a symposium of the copper situation, which also gives by months the amount of 1917 exports and imports for the first 10 months of the year, also total exports and imports for the first ten months of 1916. New York and London prices are given for October 18 and 25 and November 1, 8 and 15, 1917. The report in part says: "Copper market prices, as recently fixed by the Government, remain at 23½ cents, and this level of values will continue until January 31. It appears, however, that sales on that basis have been quite limited. It is needless to state that there is no difficulty in finding a good outlet for all the copper available at the price above mentioned. Indeed, trade could easily be developed which would absorb much more metal than is now being consumed if supplies were more abundant. The whole trend of conditions in the industrial world indicate that there is plenty of business in sight to keep manufacturing capacity at work close to 100 per cent, provided there was an equal maintenance of activity at all points of productive power supplying the raw materials. The great need of the hour is the thorough co-ordination of the constructive and manufacturing forces of the country, so that all the facilities of the nation may be fully utilized. To achieve this end it is also absolutely essential that both skilled and unskilled labor cooperate in the plan of creating and maintaining the greatest possible industrial expansion." The report also gives amount of copper produced at various mines in August, September and October, and during the first 10 months of 1917.

Massachusetts Electric Forms Protective Committee.

A protective committee has been formed to protect interests of holders of preferred shares of the Massachusetts Electric Company. Robert C. Mores, of Jackson & Curtis, is chairman. Circular issued by the company, in part is as follows: "On April 1, 1918, $3,000,000 of notes of the Massachusetts Electric Company will fall due. The principal asset is its interest in stocks of the Bay State Street Railway, a majority of the common stock of which is pledged as security for the notes. We believe these notes will not be paid and probably cannot be renewed in full. This will bring to an acute issue questions affecting the relative positions of the preferred and common shareholder. We urge you to become parties to an agreement dated November 26 by depositing your shares at once with the Old Colony Trust Company."

Edison Electric Illuminating Company of Boston has sold an issue of $2,000,000 two-year 6 per cent notes, dated December 1, 1917, due December 1, 1919, to a syndicate composed of Lee, Higginson & Company, the Old Colony Trust Company, F. S. Moseley Company, Kidder-Peabody & Company and Parkinson & Burr. The notes are being offered at 98¾ and interest, to yield about 6.65 per cent. The issue is to provide for completing the company's construction program.

United Light & Railways Company, Boston, Mass., has authorized new issue of $1,500,000 six per cent bond secured gold notes, proceeds to be used to retire $750,000 six per cent notes, due January 1, 1918, and to take care of additions and improvements.

Public Utility Dividends.

General Electric Company voted a special semi-annual stock dividend of $2 a share. The company has declared the regular quarterly dividend of $2 payable January 15 to stock of record December 7. The special semi-annual dividend is payable January 15 to stock of record December 7. A special meeting of stockholders will be held in Schenectady January 3 to vote on increasing the capital stock from the present amount of $105,000,000 to $125,000,000. Books close December 7 and reopen January 4.

Montana Power Company has declared a regular quarterly dividend of 1¾ per cent on preferred stock, payable January 2, 1918, to stockholders of record at the close of business December 15, 1917. A dividend of 1¼ per cent on common stock has been declared, payable January 2, 1918, to stockholders of record December 15, 1917.

United Light & Railways Company is contemplating a new note issue to retire the $750,000 6 per cent notes maturing January 1, 1918, and to reimburse the company for necessary additions, extensions and improvements to its property.

New York & Queens County Electric Light & Power Company has declared its regular quarterly dividend of 1 per cent, payable December 1 to stock of record November 23.

Philadelphia Electric Company's board of directors have declared a quarterly dividend of 1¾ per cent (being 43.75 cents a share) upon capital stock of the company, payable December 15 to stockholders of record November 23.

Eastern Texas Electric Company has declared its regular semi-annual dividends of $3 a share on preferred stock and $2.50 a share on common stock, payable January 2 to stock of record December 18.

Niagara Falls Power Company has declared its quarterly dividend of $2 a share, payable January 15 to stock of record December 31.

American Public Service Company has declared its regular quarterly dividend of 1¾ per cent on preferred stock, payable January 2 to stock of record December 15.

Consolidated Gas, Electric Light & Power Company, Baltimore, has declared its regular quarterly dividend of 2 per cent, payable January 2 to stock of record December 15.

Middle West Utilities Company has declared a dividend of 50 cents in cash on common stock, payable January 2 to stock of record December 15.

Standard Gas & Electric Company has declared its regular quarterly dividend of 1½ per cent on preferred stock, payable December 15 to stockholders of record November 30.

Muskogee Gas & Electric Company has declared its regular quarterly dividend of 1¾ per cent on preferred stock, payable December 15 to stockholders of record November 30.

Westinghouse, Church, Kerr & Company have declared the regular quarterly dividends of 1¼ per cent on common and 1½ per cent on preferred stocks, both payable December 10 to stock of record December 1.

Report of Earnings.

THE DAYTON POWER & LIGHT COMPANY.

	October, 1917.	October, 1916.	Inc. or dec. Pct.	Ten months ended October 31, 1917.	Ten months ended October 31, 1916.	Inc. or dec. Pct.	Twelve months ended October 31, 1917.	Twelve months ended October 31, 1916.	Inc. or dec. Pct.
Gross earnings	$ 174,388	$ 146,085	19.37	$1,486,280	$1,284,474	15.71	$1,815,680	$1,527,148	18.89
Oper. exp. (including depreciation and taxes)	112,892	97,929	15.28	1,003,288	747,129	34.29	1,256,121	870,071	44.37
Net earnings	$ 61,496	$ 48,156	27.70	$ 482,992	$ 537,345	10.11*	$ 559,559	$ 657,077	14.84*
Non-operating revenue	1,257	387	224.72	8,745	5,106	71.27	10,258	7,957	28.92
Total income	$ 62,753	$ 48,543	29.27	$ 491,737	$ 542,451	9.35*	$ 569,817	$ 665,034	14.32*
Interest on bonds	$ 15,121	$ 15,204	.55*	$ 151,379	$ 152,218	.55*	$ 181,787	$ 182,793	.55*
Other interest and sinking fund	9,950	4,546	118.88	101,324	35,350	186.63	119,312	41,412	188.11
Total deductions	$ 25,071	$ 19,750	26.94	$ 252,703	$ 187,568	34.73	$ 301,099	$ 224,205	34.30
Net income	$ 37,682	$ 28,793	30.87	$ 239,034	$ 354,883	32.64*	$ 268,718	$ 440,829	39.04*
Dividend on preferred stock	14,813	14,813	....	148,125	146,313	1.24	177,750	169,830	4.66
Surplus	$ 22,869	$ 13,980	63.58	$ 90,909	$ 208,570	56.41*	$ 90 968	$ 270,999	66.43*
Operating ratio	64.74%	67.04%	3.43*	67.50%	58.17%	16.03	69.18%	56.97%	21.43

*Decrease.

OCTOBER 31, 1917, AND OCTOBER 31, 1916.

ASSETS.	1917.	1916.
Property investment	$12,583,039.09	$10,669,143.93
Security investment	2,500.00	2,500.00
Construction fund	172,403.35	1,230,722.54
Current assets	268,267.42	209,275.36
Nominal assets	8,713.00	5,686.50
Supply accounts	163,156.74	113,847.42
Unamortized discount and exp.	100,437.59	104,730.05
Prepaid accounts	9,477.12	13,946.25
Suspense accounts	2,787.61	1,100.04
	$13,310,781.92	$12,350,952.09

LIABILITIES.	1917.	1916.
Funded debt	$ 4,879,000.00	$ 4,899,000.00
Current liabilities	974,696.20	265,861.75
Accrued liabilities	237,575.28	206,030.91
Coupons and dividends matured	8,713.00	5,686.50
Reserves	497,304.59	351,168.16
Captal stock—Preferred	2,962,500.00	2,962,500.00
Captal stock—Common	3,053,000.00	3,053,000.00
Surplus	697,992.85	607,704.77
	$13,310,781.92	$12,350,952.09

BYLLESBY EARNINGS

Combined earnings of all Byllesby properties for the month of October and the twelve months ended October 31, years ending 1917 and 1916, are reported as follows:

	Gross	Operating Expenses	Net
October, 1917	$ 1,628,949	$ 941,950	$ 686,999
Twelve Months	18,963,538	10,096,288	8,600,250
October, 1916	1,439,939	728,777	711,162
Twelve Months	16,789,573	8,544,999	8,244,574

NORTHERN STATES POWER COMPANY

	Gross	Operating Expenses	Net
October 1917	$ 644,547	$ 364,218	$ 280,329
Twelve Months	6,955,250	3,441,045	3,514,205
October, 1916	546,489	234,419	312,070
Twelve Months	5,907,764	2,632,377	3,275,387

OKLAHOMA GAS & ELECTRIC COMPANY

	Gross	Operating Expenses	Net
October, 1917	$ 165,151	$ 114,367	$ 50,784
Twelve Months	2,450,192	1,598,654	851,538
October, 1916	169,410	105,612	63,798
Twelve Months	2,262,334	1,427,352	834,982

SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY

	Gross	Operating Expenses	Net
October, 1917	$ 137,299	$ 73,953	$ 63,346
Twelve Months	1,551,181	838,229	712,952
October, 1916	125,943	69,591	56,352
Twelve Months	1,524,078	778,052	746,026

WESTERN STATES GAS & ELECTRIC COMPANY

	Gross	Operating Expenses	Net
October, 1917	$ 114,652	$ 70,666	$ 43,986
Twelve Months	1,366,862	734,442	632,420
October, 1916	103,274	56,560	46,714
Twelve Months	1,226,642	639,709	586,933

PACIFIC GAS & ELECTRIC COMPANY

	1917	1916
October gross	$ 1,619,738	$ 1,541,633
*Total income	1,672,175	1,566,406
Net after taxes	489,404	584,337
Surplus after charges	128,507	247,987
Balance after preferred dividends	4,571	130,625
Ten months' gross	16,296,963	15,333,261
*Total income	16,743,884	15,687,374
Net after tax	6,266,676	6,666,071
Surplus after charges	2,699,708	3,289,451

*Including $24,928 in October, 1917, and $28,320 in October, 1916, involved in rate litigation; $271,889 for 10 months of 1917, and $289,947 in 1916.

CENTRAL STATES ELECTRIC CORPORATION

Earnings of Cleveland Electric Illuminating Company, a subsidiary of Central States Electric Corporation, compare as follows:

	1917	1916
October gross	$ 614,951	$ 443,956
Net after taxes	193,887	161,087
Surplus after charges	106,052	75,862
Ten months' gross	5,384,290	4,074,364
Net after taxes	1,580,566	1,861,664
Surplus after charges	645,082	1,073,066
Twelve months' gross	6,419,663	4,917,366
Net after taxes	1,845,587	2,156,599
Surplus after charges	723,625	1,116,823

Earnings subsequent to April 25, 1914, are subject to adjustment after decision in pending rate proceedings, the exact result of which cannot now be determined.

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY.

Earnings of Consumers' Power Company, a subsidiary of Commonwealth Power, Railway & Light Company, compare as follows:

	1917.	1916.
October gross	$ 514,112	$ 418,910
Net after taxes	220,910	225,358
Surplus after charges	103,365	120,778
Bal. after pfd. div.	53,365	82,403
Ten months' gross	4,655,528	3,791,594
Net after taxes	2,289,334	2,315,006
Surplus after charges	1,215,392	1,310,114
Bal. after pfd. div.	745,392	931,364
Twelve months' gross	5,611,135	4,586,824
Net after taxes	2,825,998	2,826,323
Surplus after charges	1,535,322	1,598,784
Bal. after pfd. div.	980,322	1,150,659

STANDARD GAS & ELECTRIC COMPANY.

Earnings of Northern States Power Company, a subsidiary of Standard Gas & Electric Company, compare as follows:

	1917.	1916.	1915.
Sept. gross	$ 566,322	$ 485,175	$ 407,179
Net after taxes	225,672	255,767	223,107
12 months' gross	6,857,192	5,822,702	4,903,337
Net after taxes	3,545,946	3,233,956	2,714,075

During the twelve months ended September 30, 1917, fixed charges amounted to $1,655,857, leaving a balance of $1,890,089. Surplus after preferred dividends, available for depreciation, amortization, etc., amounted to $1,003,097.

UNITED LIGHT & RAILWAYS

	1917	1916
Twelve months' gross	$7,330,170	$6,760,507
Net after taxes	2,749,981	2,676,907
Surplus after charges	1,291,191	1,276,214
Holding Company: Twelve months' gross	$1,275,178	$1,257,770
Total gross	2,029,465	1,855,886
Net after taxes	1,863,900	1,716,501
Surplus after charges	1,198,599	1,145,414
Balance after preferred devidends	595,263	552,136

DETROIT EDISON COMPANY.

	1917.	1916.
October gross	$1,129,437	$ 905,016
Net after taxes	300,190	333,536
Surplus after charges	213,435	245,420
Ten months' gross	9,827,671	7,961,265
Net after taxes	2,912,518	2,914,571
Surplus after charges	2,059,826	2,019,547

AURORA, ELGIN & CHICAGO

	1917	1916
September gross	$ 202,865	$ 183,594
Net after taxes	64,850	58,699
Surplus after charges	22,576	15,623
Nine months' gross	1,638,859	1,537,671
Net after taxes	472,917	516,442
Surplus after charges	92,045	141,728

SOUTHERN CALIFORNIA EDISON COMPANY

	1917	1916
October gross	$ 624,229	$ 659,572
Net after taxes	360,023	382,406
Total income	438,069	392,370
Balance after interest	211,056	202,016
Total balance	234,781	202,016
Ten months' gross	6,276,361	6,792,054
Net after taxes	3,843,046	4,012,705
Total income	4,356,653	4,206,832
Balance after interest	2,364,723	2,290,179
Total balance	2,506,227	2,290,179

PHILADELPHIA RAPID TRANSIT

	1917	1916
September gross	$2,419,584	$2,226,060
Net earnings	1,030,246	1,015,275
Surplus after charges	219,081	200,865
Three months gross	7,293,659	6,590,825
Net earnings	3,069,879	2,935,092
Surplus after charges	634,943	490,403

AMERICAN POWER & LIGHT COMPANY

(Inter-company items eliminated.)

	1917	1916
October gross	$1,004,972	892,972
Net earnings	423,643	417,696
Twelve months' gross	11,176,141	10,137,148
Net earnings	4,772,565	4,689,534

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate Per cent.	Bid Nov. 27.	Bid Dec. 4.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	17	15½
Adirondack Electric Power of Glens Falls, preferred	6	70½	68
American Gas & Electric of New York, common	10+extra	85	85
American Gas & Electric of New York, preferred	6	40	41
American Light & Traction of New York, common	..	222	224
American Light & Traction of New York, preferred	6	92	93
American Power & Light of New York, common	4	37	40
American Power & Light of New York, preferred	6	65	72
American Public Utilities of Grand Rapids, common	..	24	25½
American Public Utilities of Grand Rapids, preferred	6	57	58
American Telephone & Telegraph of New York	..	107¾	105
American Water Works & Elec. of New York, common	..	4	5
American Water Works & Elec. of New York, particip	7	8	8
American Water Works & Elec. of New York, first preferred	..	57	57
Appalachian Power of Bluefield, common	..	1	2½
Appalachian Power of Bluefield, preferred	7	15	18
Cities Service of New York, common	+extra	208	209
Cities Service of New York, preferred	6	72½	73¼
Commonwealth Edison of Chicago	8	107	102
Comm. Power, Railway & Light of Jackson, common	4	25	36
Comm. Power, Railway & Light of Jackson, preferred	6	60	63
Federal Light & Traction of New York, common	..	4	4
Federal Light & Traction of New York, preferred	..	25	25
Illinois Northern Utilities of Dixon	6	77	76
Middle West Utilities of Chicago, common	2+$ extra	25	28
Middle West Utilities of Chicago, preferred	6	58	57
Northern States Power of Chicago, common	ex. div.7	54	62
Northern States Power of Chicago, preferred	ex. div.7	84	85
Pacific Gas & Electric of San Francisco, common	5	35	34
Pacific Gas & Electric of San Francisco, preferred	6	80	81
Public Service of Northern Illinois, Chicago, common	7	73	73
Public Service of Northern Illinois, Chicago, preferred	6	..	88
Republic Railway & Light of Youngstown, common	4	23	23
Republic Railway & Light of Youngstown, preferred	6	55	55
Standard Gas & Electric of Chicago, common	..	4½	4½
Standard Gas & Electric of Chicago, preferred	6	18	20
Tennessee Railway, Light & Power of Chattanooga, common	..	2½	2½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	9	10
United Light & Railways of Grand Rapids, common	4	28	27
United Light & Railways of Grand Rapids, preferred	6	62	59
Western Power of San Francisco, common	..	7	10
Western Power of San Francisco, preferred	6	40	40
Western Union Telegraph of New York	extra	..	81
Industrials—			
Electric Storage of Philadelphia, common	4	49½	49
General Electric of Schenectady	8	127½	129
National Carbon of Cleveland, common	8	56¼	56¼
National Carbon of Cleveland, preferred	..	130½	130⅝
Westinghouse Electric & Mfg. of Pittsburgh, common	+extra	38¾	38
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	57	..

*Last sale.